U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-260 945

Air Pollution Abstracts
Volume 3, Number 3
March 1972

Environmental Protection Agency, Research Triangle Park, N C

Mar 72

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. APABCA-3-3-1972	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Air Pollution Abstracts Volume 3, No. 3		5. REPORT DATE March 1972
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Air Pollution Technical Information Center Research Triangle Park, North Carolina 27711		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Same		13. TYPE OF REPORT AND PERIOD COVERED
		14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 17026 - 17905.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Abstracts Information retrieval		13B 5B

18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES 211
	20. SECURITY CLASS *(This page)*	22. PRICE $7.75

EPA Form 2220-1 (9-73)

344026

PB 260 945

Volume 3, No. 3
March 1972

APABCA-3(3) (1972)

AIR POLLUTION ABSTRACTS

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs

AIR POLLUTION ABSTRACTS

Vol. 3, No. 3 March 1972

Prepared by:
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

CONTENTS

Introduction ii
Subject Fields and Scope Notes iii
Abstract Bulletin 1
Subject Index si-1
The terms that most closely describe the information presented in the documents are arranged alphabetically.

Author Index ai-1
Personal authors are arranged alphabetically. The names are presented last name first. The title of the document is indented below the author's name; when the author is the first author of a title, an asterisk precedes the Abstract Number on the next line.

Publishers Address Listings Pl-1

Use of funds for printing this publication approved by the Director, Bureau of the Budget, March 31, 1970

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

INTRODUCTION

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

EPA's air pollution staff should direct requests for full text duplicates (if not locally available) to APTIC, using the order form provided. Translations of foreign language documents will be arranged upon request for these personnel only.

For non-EPA readers, APTIC can provide copies of only those articles that have been written by EPA's air pollution personnel and have not been published in the open literature. Requests for all other articles should be directed to local libraries, publishers, or authors, with the following exception. Copies of EPA's air pollution technical publications in the AP or APTD series, as indicated in the citation, will be provided, while supplies permit, only to certain qualified requesters, e.g., its current contractors, grantees, and air pollution control agencies; a list of these publications is available on request. When requesting any publications from APTIC, please include the complete citation.

Citations of documents available for purchase from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151 are designated as NTIS; most are sold for three dollars in paper copy and ninety-five cents in microfiche. Registered users of the Defense Documentation Center (DDC) may obtain documents in the "AD" series for the same service charge from: Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. Citations of documents available for purchase from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. are designated as GPO.

Translations are cited with their sources whenever possible. If a translation proves to be unavailable from the source cited, or if a translation is cited without a source, it may be located through APTIC or through the National Translations Center, 35 West 33rd Street, Chicago, Illinois 60616.

The serial publications (journals, periodicals, etc.) which are regularly screened for input are listed with their publishers' addresses in one issue in each volume of our abstract bulletin; the most recent list appeared in the December 1971 issue.

As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching—more than those included in the subject index in each issue.

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry—e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS–HUMAN HEALTH

Covers medical and epedemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS–PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants–and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS–MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractural activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

17026 APTIC NO. 35221

Tennessee Valley Authority, Chatanooga, Office of Health and Environmental Science

ENVIRONMENTAL STATEMENT: GAS TURBINE PEAKING PLANT ADDITION THOMAS H. ALLEN STEAM PLANT - MEMPHIS TENNESSEE (DRAFT). *12p., May 21, 1971.*

NTIS: PB 199231-D

A four-unit addition is planned for the existing 16-unit gas turbine plant at the Tennessee Valley Authority Allen Steam Plant in Memphis. The addition will have a total generator nameplate rating of 238,300 kw and will be used primarily to meet system peak power loads. Each of the four units will be equipped to burn distillate fuel oil or natural gas. In either case, the opacity of turbine exhaust will be Ringlemann No. O during normal operation and between Ringlemann Nos. 0 and 1 during startup. When using fuel oil, approximately 1.0 ton of sulfur dioxide/hr and 1.25 tons of nitrogen oxides/hr will be emitted at full load. When operating at full load on natural gas, the expected emission rates are 1.2 pounds of SO2/hr and 0.8 ton of nitrogen oxides/hr. When operating both the new and the existing gas turbines on oil at full load with simultaneous full-load operation with coal at the existing steam plant, the new gas turbines will cause a five percent increase in SO2 emissions and a 12% increase in nitorgen oxide emissions. Since the turbines are operated intermittently, the total annual increase in SO2 and nitrogen oxide emissions resulting from the new units will be 0.5% and 1.9%, respectively. Since no cooling water will be required and no effluent will be discharged into water from the plant, the only apparent potential for water pollution is the possibility of oil spills during barge unloading or oil storage leaks. Should a spill occur, recovery will be accomplished by a gasoline-operated, pump-type floating saucer skimmer. To prevent pollution from rupture of the storage tanks, the tanks will be located in a depression capable of containing at least two million gallons of oil.

17027 APTIC NO. 35235

Working Group on Pesticides, Washington, D. C.

SUMMARY OF INTERIM GUIDELINES FOR DISPOSAL OF SURPLUS OR WASTE PESTICIDES AND PESTICIDE CONTAINERS. *Rept. WGP-DS-1, 25p., Dec. 1970.*

NTIS, DDC: AD 720391

Selection of a method of disposal of pesticides and their containers will be influenced by several factors such as state or local legislation, distance to an authorized disposal site, and the amount and type of the pesticide or containers involved. Ocean disposal, ground disposal, and incineration are noted. Methods available are discussed according to class of disposer: household and small farm operator; large farm operator; commercial pest control operator; federal, state, and local authority; industrial user, or pesticide manufacturer. Methods of ground disposal are presented, including disposal site requirements and the susceptibility of ground water to contamination. Disposal site monitoring is indicated. The development of a systematic and reliable method for the collection of surplus or unwanted pesticides is considered, as well as storage facilities and safety precautions. Research suggestions are included.

17028 APTIC NO. 35271

Los Angeles County Air Pollution Control District, Calif.

STUDY OF JET AIRCRAFT EMISSIONS AND AIR QUALITY IN THE VICINITY OF THE LOS ANGELES INTERNATIONAL AIRPORT. *Environmental Protection Agency Contract CPA 22-69-137, 177p. April 1971.*

NTIS: PB 198699

A study to determine the impact of jet aircraft operations on the air enviroment in the vicinity of a major air terminal showed that the Los Angeles International Airport is a significant area source of air contaminants, generally upwing of metropolitan Los Angeles. Total daily emissions within the 4.7 square mile airport area are 122 tons. Aircraft using the airport emit an additional 45 tons daily below 3500 ft altitude in Los Angeles County but outside the airport boundary. Although particulate emissions for the JT4A engine are very conspicuous during both final approach and take-off, about 60% of average total flight particulate emissions below 3500 ft occurs during taxi and idle modes after arrival touchdown and before initiating the take-off run. Gains could be achieved by minimizing engine running time on the ground. The new smokeless JT9D turbofan engine, which powers the 747 superjet, emits less visible emissions and about the same total weight of air contaminants per flight as the lower thrust JT4A turbojet and JT3D turbofan engines, and one-half the total from the unmodified JT8D turbofan engine. One result of airport activities is an increased soiling effect. Atmospheric carbon monoxide values average 4-11 ppm in areas adjacent to and circumscribing the airport complex, but emissions from automobile traffic must also be considered in any appraisal of (any) the impact of an airport on the surrounding community. Carbon monoxide levels were also determined in aircraft cabins.

17029 APTIC NO. 35361

NEW PROCESS TO COMBAT AIR AND WATER POLLUTION. *(Procede nouveau contre la pollution de l air et des eaux). Text in French. Genie Civil, 147(10):459-460, Oct. 1970.*

A new fuel combustion method devised by ELF Union and S. A. Heurtey of France, called the ELF method, burns a water-fuel emulsion which burns differently from pure fuel. The completely automatic burner can be used for space heating, incineration, and industrial boilers and can be fed by either heavy or light fuel oil. The installation consists of a fuel heating circuit, a water heating circuit, a mixer of the two fluids, an emulsifying pump and the burner proper with an emulsion and air feed. The burner eliminates the emission of up to 90% particulates. In the Paris area in December 1969 the combustion of 100,000 tons of heavy oil and 40,000 tons of light oil resulted in the emission of 300 tons of particulates. The use of ELF burners would have reduced this emission to 20 or 30 tons. The method reduces the emission of sulfur trioxide to one-third but does not alter the emission level of SO2. Since moderately polluted water can be employed, in many cases costly water purification becomes unnecessary. Three boilers equipped with ELF burners have been in operation in a thermal power plant in Buttes-Chaumont since October 1969.

17030 APTIC NO. 35381

ALUMINUM. *In: Bureau of Mines Mineral Yearbook. Washington, D. C., Government Printing office, 1969, 22p. 14 refs.*

The aluminum industry is reviewed with respect to domestic production, costs, recycling of aluminum scrap, consumption, foreign trade, and technology. Improvements in aluminum potline efficiency, the use of electric charges in the processes, producing alumina from aluminiferous raw materials, with no waste products emitted into the atmosphere, and strengthening the superficial characteristics of aluminum are examined.

17031 APTIC NO. 35432

DRAFT ENVIRONMENTAL IMPACT STATEMENT. *Nevada State Dept. of Highways, Carson City, Roadside Development and Environmental Services Unit, 81p., 1971.*

NTIS: PB 199310-D

A draft statement is presented of the findings by the Environmental Section of the Nevada State Highway Department on the impact of a proposed freeway from Las Vegas Boulevard to Russell Road in Clark County, Nevada. Some adverse effects upon the environment can be expected to accrue from a project of this magnitude which is to be constructed through a densely populated urban area; namely, noise and air pollution, displacement of residences and businesses, and change in land use. Planning and design criteria are discussed.

17032 APTIC NO. 35435

ENVIRONMENTAL IMPACT STATEMENT FOR WALTER REED ARMY MEDICAL CENTER: LINE ITEM NO. 87 NEW WALTER REED GENERAL HOSPITAL. *Department of the Army, Washington, D. C., Office of the Assistant Secretary, 73p., May 19, 1971. 15 refs.*

NTIS: PB 199314-D

The construction and/or operation of the new Walter Reed General Hospital (WRGH), Washington, D. C., should have no adverse environmental effects, although the replacement of several old buildings with a single large structure and the addition of new hospital parking facilities will have some impact on scenery and traffic circulation. Three minor sources of air pollution at the Walter Reed Army Medical Center (WRAMC) are a gasoline storage tank and two incinerators. The storage tank will be removed prior to construction of the new hospital, and plans are underway to replace or modify the incinerators to bring stack emission within allowable limits. Solid wastes generated at the hospital will be transported to the new National Institutes of Health incinerator at Forest Glen. Radioactive waste will continue to be transported to an AEC-approved disposal site in Maryland. The two municipal sewer systems (storm and sanitary) serving the WRAMC complex have adequate capacity for the new WRGH project. Future mass transportation systems which will serve WRAMC will be valuable assets in reducing traffic flow and congestion at the center.

17033 APTIC NO. 35436

ANALYSIS AND ADVANCED DESIGN STUDY OF AN ELECTROMECHANICAL TRANSMISSION. *TRW Systems Group, Redondo Beach, Calif., Office of Air Programs Contract EHSH 71-002, 248p., April 1971. 12 refs.*

NTIS: PB 203463

The design and data analysis are discussed of a heat engine-battery hybrid propulsion system for vehicles. A short review is presented of the basic operational modes of the transmission developed by TRW Systems, the Electromechanical Transmission. It describes and stresses the functional requirements placed on the equipment by the hybrid system. The traction system of the Electromechanical Transmission is discussed and, in particular, the various methods of controlling the Torquer or traction device. A short discussion of candidate systems is presented leading to the selection of a DC chopper using pulsewidth modulation. Various time ratio controlled philosophies and circuits are reviewed. The generator system is discussed, as well as the specifications and construction details of the rotating machine used in the present system. Dynamometer testing of the Electromechanical Transmission is included, together with recommended methods of improving machine performance. Certain hybrid power train startup concepts are suggested and related to possible emission control schemes. 0

17034 APTIC NO. 35444

HYDROCHLORIC ACID AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY. *Office of Air Programs, Research Triangle Park, N. C., Air Pollution Technical Information Center, Pub-AP-100, 107p., July 1971. 164 refs.*

NTIS: PB 203341

A bibliography is presented which contains 164 abstracts of documents and articles pertaining to hydrochloric acid and air pollution. Emission sources, atmospheric interaction, measurement methods, control methods, legal and administrative factors, standards, and criteria are considered. The effects of hydrochloric acid on human health, plants and livestock, materials, and economics are also documented. Basic science and technology pertaining to hydrochloric acid is documented.

17035 APTIC NO. 35446

CHLORINE AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY. *Office of Air Programs, Research Triangle Park, N. C., Air Pollution Technical Information Center, Pub-AP-99, 113p., July 1971. 162 refs.*

NTIS: PB 203355

A bibliography is presented which contains 162 abstracts of documents and articles pertaining to chlorine and air pollution. Emission sources, atmospheric interaction, measurement methods, control methods, air quality measurement, standards and criteria, and basic science and technology are considered. Human health effects due to chlorine are also indicated, as well as effects on plants, livestock, and materials.

17036 APTIC NO. 35449

California Testing Lab., Chaney (Albert L.) Chemical Lab., and Smith-Emery Co.

REPORT ON THE AIR CONTAMINANTS PRODUCED BY FURNACES IN THE NON-FERROUS FOUNDRY INDUSTRY. *47p., April 1948. 4 refs.*

The nature and quantity of air contaminants discharged into the atmosphere by furnaces used in non-ferrous foundries to melt brass and other alloys were determined. Sixteen series of tests were made on six representative types of equipment used for eight different alloys. The factors evaluated in relation to the quantity of air contaminants produced were type of furnace; maximum and average concentrations and the variation of concentration during the melting cycle; type of fuel used; and composition of the alloy. A standard procedure for field sampling and laboratory analysis which would be acceptable to the Los Angeles County Air Pollution Board and which would serve for determining the effectiveness of control measures to be instituted by the foundries was formulated. The principal factors causing high concentrations of zinc gases are alloy composition, pouring temperature, type of furnace, and poor foundry practice. With direct-fired furnaces, the fuel-air ratio should be carefully controlled to avoid either excessive smoke or excessive volatilization of zinc. The principal factors governing the dilutions of the furnaces are the required cooling of furnace gases before use of fume collecting equipment and the necessity for efficient removal of all fumes by the hood in order to reduce toxic metallic fumes to satisfactory concentrations. Sulfur dioxide concentrations in stack gases will be within permissible limits provided sulfur content of fuel oil does not exceed 5% using hoods and stacks with a dilution ratio of at least 3:1.

17037 *APTIC NO. 35465*

FINAL REPORT ON THE EMISSIONS INVENTORY FOR THE STATE OF SOUTH CAROLINA. TRW Systems Group, McLean, Va., Washington Operations, Office of Air Programs Contract 68-02-0048, 102p., Aug. 1971. 30 refs.

NTIS: PB 203501

A summary of the emissions inventory for the State of South Carolina is presented. Point source data required for the parparation of the inventory were obtained from questionnaires distributed by the State Agency and follow-up contacts with individual sources. The data were transferred to prepared computer load sheets and processed. Area source data were obtained from various governmental agencies and by personal contact with knowledgeable individuals. This information was also computer processed. All emissions are summarized in tabular form for each region and gridded area. Charts have been prepared to illustrate major sources of each pollutant. These sources included coal, fuel oil, and natural gas boilers, used in residential, commercial, and industrial areas, open burning, incineration, solvent evaporation, vessels, railroads, diesels, residential heating, gasoline vehicles, air craft, dumps, electric power plants, mineral products, and wood fires. Particulates, sulfur dioxide, carbon monoxide, hydrocarbons, nitrogen oxides, sulfur, and ash were listed. (Author abstract modified)

17038 APTIC NO. 35466

CANADA S LARGEST SLUDGE INCINERATORS FIRED UP AND RUNNING. *Water pollution Control (Toronto), 107(1):20-21, 24, Jan. 1969.*

Three multi-hearth sewage slude incinerators, rated at a combined capacity of 134 dry tons per day, have been constructed for a Toronto waste treatment facility. The incinerators are twelve-hearth units with a combustion capacity dependent upon the nature of the sludge. To create a closed combustion environment, the furnace is divided into three distinct zones: the upper hearths, which form a drying zone where most of the free moisture contained in the sludge cake is evaporated; the burning zone, where material is destroyed at temperatures of between 1400 and 1600 F; and the third zone of lower hearths were residual ash is cooled before discharge. The incinerators are also designed with carbon dioxide analyzers and recorders. Each incinerator is equipped with a flue gas scrubber system that effectively reduces the quantity of particulate dust that can escape from the stack. The equipment for dust removal consists of a stainless steel precooler and wet plate gas scrubber.

17039 APTIC NO. 35481

Esso Research and Engineering Co., Linden, N. J., Products Research Div.

FIRST ANNUAL REPORT ON GASOLINE COMPOSITION AND VEHICLE EXHAUST GAS POLYNUCLEAR AROMATIC CONTENT. *National Air Pollution Control Administration Contract CPA-22-69-56, Coordinating Research Council Proj. CAPE-6-68, 117p., Feb. 17, 1970. 18 refs.*

NTIS: PB 200266

Exhaust emissions of phenols and polynuclear aromatic hydrocarbons (benzo(a)pyrene and benz(a)anthracene) were investigated on cars with and without emission controls to determine the effects of fuel and vehicle variables, emission rates, phenol emission, increasing fuel aromaticity and polynuclear aromatic hydrocarbon content, changes in 0combustion chamber deposits, and adding lead to both deposits and fuels Pollution control methods for reducing carbon monoxide, nitrogen oxides and unburned hydrocarbon emissions were examined. The effect of air-fuel ratio, spark timing, operating cycles, and oil consumption on exhaust emissions was also studied. Experimental procedures and test data are included.

17040 APTIC NO. 35592

National Materials Advisory Board, Washington, D. C., Panel on Fluorspar

TRENDS IN THE USAGE OF FLUORSPAR. *National Academy of Sciences - National Academy of Engineering, Washington, D. C., Pub. NMAB-269, 54p., Dec. 1970. 21 refs.0*

NTIS: PB 198339

Three major segments of American industry (steel, aluminum, and fluorocarbon producers) use approximately 93% of the fluorspar consumed in the United States and will probably continue to require large and assured supplies well beyond the next decade. The fluorspar demand of the aluminum industry may decrease because of fluorine recovered from waste products and phosphate production. However, the overall fluorspar demand should contiue to grow as the result of increasing requirements for the product of steel and fluorcarbons. The total fluorspar demand was 1.24 million tons in 1968 and is projected to increase to 1.8 million in 1975 and to 2.2 million in 1980. Due to environmental concern, secondary sources of fluroine are beginning to be exploited in greater volume. The principal source is a by-rooduct from the production of phosphates. (Author abstract modified)

17041 APTIC NO. 35616

WORLD S LARGEST STORAGE FOR L. P. G. *Natur. Gas L.P.G., vol 1:36-37, Nov. 1967.*

The construction and design of a storage facility for liquefied natural gas near Hopkinton, Mass. is described in which the first step was the drilling of 224 prefreeze holes, 195 ft deep, spaced 4 ft apart, around the outlined perimeters of the two excavation sites. Concentric pipes were installed in the holes and calcium chloride brine was pumped through these pipes and circulated through a freezing unit to freeze the ground from the surface down to the planned bottom of the holes, thus protecting subsequent excavation from the flow of water, allowing for a neat trim in the excavation of the soil overburden, and making the storage tanks leakproof. The liquefaction plant consists of four natural gas-burning engines that develop a total of 11,500 hp to drive various pumping systems. The pumps and compressors are designed to bring gas from the pipeline system into the liquefaction plant and move it through the refrigeration process. Gas from the pipelines comes into the plant at about 60 F and flows through heat exchangers to be cooled to minus 40 F by propane refrigerant, and then to minus 140 F by ethylene refrigerant. At this point another set of heat exchangers is utilized and the pressure is reduced; some of the liquid vaporizes, taking heat with it and leaving the cooler portion at the final minus 260 F temperature, at which the liquefied methane is piped to storage at a net rate of 12.5 million cu ft/day.

17042 APTIC NO. 35622

Coordinating Research Council Inc., New York. Air Pollution Research Advisory Committee

APRAC. INTERIM STATUS REPORT. *31p., July 1971.*

Engineering, atmospheric, medical, and in-house projects an automotive air pollution, generated by the Air Pollution Research Advisory Committee of the Coordinating Research Council, are briefly summarized. The projects include studies on the effects of gasoline additives; use of leaded fuels; fuel volatility; gasoline composition; exhaust odors; combustion processes; automotive fueling emission; driving patterns; measurement methods for nitrogen oxides, oxygenates, particulates, and polynuclear aromatics, chamber reactivity; plant damage; diffusion models; carbon monoxide and light hydrocarbons in the atmosphere; haze formation; pollution in urban areas; effects of carbon monoxide, aromatic hydrocarbons, oxidants, and nitrogen oxides human health; exhaust gas sampling; and vehicle emissions. A list of published reports is included.

17043 APTIC NO. 35676

Federal Aviation Administration, Washington, D. C., System Planning Div.

CHESTERFIELD COUNTY AIRPORT, CHESTERFIELD, VIRGINIA. DRAFT ENVIRONMENTAL IMPACT STATEMENT PURSUANT TO SECTION 102 (2) (C) ENVIRONMENTAL POLICY ACT OF 1969 (P.L. 91-190). *24p., April 27, 1971. 2 refs.*

NTIS: PB 198759

The potential impact on the environment of a proposed airport to accomodate single-engine and light twin-engine aircraft at Chesterfield, Virginia, is investigated. Site description, construction techniques, noise levels, water pollution, and effects on air quality are considered. Projected emission concentrations of carbon monoxide, organics, nitrogen oxides, particulates (lead compounds and soot), and sulfur dioxide were computed for engine cycles, and air quality criteria were established.

17044 APTIC NO. 35779

NONPOLLUTING STEAM BUS TAKES TO THE ROADS. *Machine Design, 43(31):8,10, Dec. 23, 1971.*

A steam bus is now operating in the San Francisco area on an experimental basis. Although considered a preprototype, the bus exceeds 1975 California standards for carbon monoxide by more than 12 to one and those for hydrocarbons and nitrogen dioxide by more than two to one. The steam generator, installed in the original engine compartment at the rear of the coach, is based on a monotube concept. Unlike conventional boilers, no steam drums are used. There is no boiler to rupture in the event of an accident. Rather, a forced circulation of a small amount of water and steam is induced through 1400 ft of coiled tubing. A system of automatic controls governs the flow of fuel and water to provide the steam required by varying operating conditions. Road performance of the bus is similar to identical coaches with V-6 engines, the three-cylinder, double-acting expander engine yielding 203 net hp at 2100 rpm.

17045 APTIC NO. 35782

WANKEL ENGINE: A CPI VIEW. *Chem. Eng., 78(28):56, 58, Dec. 13, 1971.*

By 1980, 50% of the cars produced in the U. S. may have rotary- combustion Wankel engines. Reasons for this trend are these: the simple design of the Wankel calls for fewer parts than the present reciprocating engine, slashing metals requirements; the engine runs well on low-octane gasoline; and engine emissions are better suited to control than those from a piston engine. Due to its relatively large quench zone volume, the uncontrolled Wankel emits more hydrocarbons and carbon monoxide than piston engines. However, the higher hydrocarbon level helps seed a thermal reactor, while the hotter exhaust gas upgrades performance of both thermal reactors and catalytic converters. Moreover, engine design is easily adapted to internal recirculation of exhaust gases. Because of lower peak temperature, Wankel levels of nitrogen oxides are below those of piston engines. Ways of reducing Wankel emissions by stratified charge are under study. LEGAL AND ADMINISTRATIVE ASPECTS: Abatement, Air quality standards, Water In the Southeast, industrial development efforts are now moving in tandem with efforts to protect natural resources -- even at the risk of irritating industry. All seven southeastern states have adopted air and water quality standards and require permits to construct and operate new, expanded, or modified sources of air and water contaminants. Tax exemptions, especially property tax exemptions on abatement facilities, provide incentives for compliance with control legislation. The air and water quality standards pertaining in each of the seven states (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee) are given together with a list of southeastern pollution control agencies. The Tennessee air quality standards are unique in that they are based on land use. Enforcement procedures, permits, emission standards, and other legal aspects are included.

17046 APTIC NO. 35837

Ministry of International Trade and Industry (Japan); Mie Prefecture (Japan); Yokkaichi City (Japan); Industrial Pollution Control Council (Japan)

REPORT ON INVESTIGATIONS FOR YOKKAICHI AREA AIR POLLUTION CONTROL MEASURE. *(Mieken Yokkaichi chiku taiki osen boshi taisaku chosa hokokusho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 7(11):634-654, Nov. 1971.*

A comprehensive report on the investigation conducted in 1969 with regard to the air pollution in the Yokkaichi area discusses the general necessity of control measures, the state of air pollution in the Yokkaichi area, the method of investigation, the future forecast and guidances given to thy industries, the results, and the future problems. The yearly records of settling particle averages in Yokkaichi show the general decline from the peak year 1961 when the index was 13.0 ton/sq km/month to 8.6 ton/sq km/month of 1969 and 9.2 ton/sq km/month of 1970. The sulfur dioxide concentration also decreased from 0.083 ppm in 1965 to 0.05 ppm in 1969 in the most polluted area; but in other areas, the SO2 indexes have stayed approximately the same. Experiments were carried out by a wind tunnel simulation, theoretical dispertion was calculated, and the results were synthesized and modified by meteorological factors. Guidances were given to various industries with regard to the stack height, collectivization of stack gases, and the use of low sulfur fuels. The maximum emission standard was set at 0.25 ppm, and 0.20 ppm for industries with SO2 emission. For industries with more than 0.20 ppm emission rate, drastic improvements were advised, and the use of less than 1.7% sulfur content fuel was urged.

17047 APTIC NO. 35953

LEAD ELIMINATION FROM LEADED GASOLINE. *(Blei-Eliminierung aus dem Bleibenzin). Text in German. Protectio Vitae, 16(5):231-234, Oct. 1971.*

Man s use of lead has led to pollution of the environment to 0the extent that the natural background concentration can no longer be determined. The lead contamination by industries is enhanced by the combustion of lead-containing gasolines. The lead concentrations in the gasolines differ and range from 0.2 g/l to 1.1 g/l (average 0.44 g/l). The total quantity of lead emissions from automobiles is estimated to amount to several hundred thousand tons per year for the northern hemisphere. This amount increases each year by 3.5%. The ground level air along highways and streets and in cities contains about 10 micrograms Pb/cu m. Sometimes this amount rises to 40 micrograms/cu m and more. According to the World Health Organization, the air man breathes should not contain more than two micrograms Pb/cu m. Inhaled and ingested lead has a long residence time in organs, which increases the danger of an accumulation of the element. The smallest concentrations of lead inhibit the activity of the delta-aminolevulinic acid dehydratase. Tetraethyl lead can permeate healthy skin and can concentrate in the central nervous system.

17048 APTIC NO. 36029

SCIENTISTS SHOW INDEXES OF POLLUTION. *Chem. Eng. News, 50(2):33-35, Jan. 10, 1972.*

Scientists at the American Advancement of Science Meeting in Philadelphia discussed the indexes of pollution used to determine the relative importance of various pollutants. An index of priorities in handling pollution is cited, which rates 20 discrete stresses on the environment. These range from a benchmark nuclear war, which hits the top of the danger scale at a reading of 225, to pesticides, heavy metals, polluting gases and liquides, heat, and noise. The net reading for each of these stresses is the product of three coefficients for persistance, geographical range, and inter-system complexity of effects on humanity, resources, and the environment. An important indication from the index is the observation of trends. Only water and timber have made gains in the past year, while soil quality slipped two points with haphazard land development.

17049 APTIC NO. 35255

Alexander, Robert M.

THE OVERVIEW. *In: Research Relating to Agricultural Field Burning. A Progress Report. Oregon State Univ., Corvallis, Air Resources Center, and Oregon State Univ., Corvallis, Agricultural Experiment Station, p. 1-6, 26 Feb. 1971. 4 refs.*

The progress and status of research relating to agricultural field burning are reviewed. Five research programs are outlined briefly: natural ventilation of the Willamette Basin, beneficial utilization of straw; development and testing of a mobile incinerator; chemical and cultural alternatives and basic physiological studies; and smoke management to reduce harmful effects from open field burning. The field burning problem is examined with respect to residue disposal, field sanitation, seed bed preparation, yield maintenance, and air pollution.

17050 APTIC NO. 35533

Bagg, J.

THE FORMATION OF OXIDES OF HYDROGEN IN FLAMES. *Clean Air (J. Clean Air Soc. Australia New Zealand), 4(1):11-15, April 1970. 16 refs.*

The details of the many possible reactions that can occur during the formation of nitrogen oxides in flames are not clearly understood, partly because the structure and chemistry of flames vary from one type of fuel to another and from one burner design to another. In some cases, much higher concentrations of nitric oxide are produced than would be expected from either equilibrium values or nonflame kinetics. Agreement between experimental and calculated values is satisfactory for lean and stoichiometric flames, but is poor for rich flames at sampling distances of 24 in or less. On the basis of available data, a flame does not act solely as a source of heat in the reaction between oxygen and nitrogen, but also plays a chemical role in providing reactive free radicals and atomic species. Calculations made with no allowance for the free radicals and atoms will underestimate the actual emission of nitrogen oxides to the atmosphere. Much more data are needed about the wide variety of flames encountered in practice before combustion conditions can be modified to reduce formation of nitrogen oxides.

17051 APTIC NO. 35202

Barber, Robert E., John C. Bond, and Everett H. Alford

THE DESIGN AND DEVELOPMENT OF A TURBINE-GEARBOX FOR USE IN AN AUTOMOTIVE ORGANIC RANKINE CYCLE SYSTEM. *Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1971. (Presented at the Society of Automotive Engineers, Mid-Year Meeting Montreal, Quebec, June 7-11, 1971, Paper 710564.)*

A small, lightweight, high-speed turbine prime mover and a speed reducing gearbox was developed for a Rankine cycle engine. The 72-lb turbine gearbox prime mover, which replaces the 500-lb internal combustion engine, provides the weight and volume saving necessary to package the entire Rankine cycle system under the hood of conventional-type automobiles. The gearbox reduced turbine speed of 45,000 rpm to the 3800 rmp output speed necessary for use in a three-speed automobile transmission. The turbine aerodynamic design and mechanical design are shown and procedures used in fabrication of the turbine gearbox are discussed. Initial development tests indicate that a Rankine cycle system with the turbine-gearbox assembly will offer a vialble solution to the automotive air pollution problem.

17052 APTIC NO. 35260

Bonlie, Russell W. and Dale E. Kirk

DEVELOPMENT AND TESTING OF MOBILE FIELD INCINERATOR. *In: Research Relating to Agricultural Field Burning. A Progress Report. Oregon State Univ., Corvallis, Agricultural Experiment Station and Oregon State Univ., Corvallis, Air Resources Center, p. 12-18, Feb. 1971.*

Using data obtained from a test combustion chamber, a mobile field incinerator was designed for use in agricultural field burning. With modifications to solve the three major problems of smoke emissions, screen plugging, and low production rate, the machine was operated at one and a quarter acres an hour with essentially no smoke emissions; the incinerator could operate at two acres an hour for short periods until temperature became too high. Further modifications to eliminate the pickup machinery and stack and to add a low pressure, high volume secondary air supply should allow a higher rate of operation. Projected results indicate that the incinerator can cut down air pollution by 90% and reduce the level of small combustible particulates to almost no visible smoke, the flue gases, however, could contain incombustible silicates or dirt particulates due to the high velocity air blowing them up from the ground.

17053 APTIC NO. 36021

Booth, M. R.

CHEMICAL ANALYSIS AND COMPOSITION OF FLUE GASES. *Ont. Hydro Res. Quart., 23(2):1-6, 1971. 8 refs.*

The analysis of flue gases from a coal-fired generating station has provided information on the identity and concentrations of some of the gases and solids being released. Sulfur dioxide is present in the highest concentration of the pollutants identified, at 700 to 1700 ppm by volume. The concentration of nitrogen oxides varies between 250 and 700 ppm, depending on load and boiler type. A study of trace pollutants, including polynuclear hydrocarbons and heavy metals, has been initiated. (Author conclusions)

17054 APTIC NO. 35238

Borisoff, B.

BATTERY POWERED ELECTRIC BUSES. *Preprint, Mitre Corp., McLean, Va., Proc. Bus Technol. Symp., McLean, Va., 1970, p. 72-87. 7 refs. (Jan. 23.)*

NTIS: PB 198619

Battery-powered electric buses for center city transportation would emit no air pollutants, are practically noiseless, require very low motor maintenance, and have lower fuel costs than gasoline, gas, or diesel buses. Two electric powered buses in operation in Lyon, France, are noted. A 20-passenger electrobus and a 90-passenger double-deck battery-powered vehicle that are technically feasible and practical are described.

17055 APTIC NO. 35138

Buurma, I. J.

INTRODUCTION TO THE PROBLEM OF AIR POLLUTION IN NETHERLANDS. *(Algemene inleiding over het probleem van de luchtverontreiniging in Nederland). Text in Dutch. Ingenieur, 82(27):G73-G74, July 3, 1970.*

General aspects of air pollution in the Netherlands are reviewed. Increasing industrialization, population, and number of automobiles are the primary cause of increased air pollution. The Ijmond area and the area south of Limburg require particular attention, due to increasing air pollution. The problem of air pollution is now a national problem. Important forms of pollutants are stack gases from industrial furnaces and household heating equipment, nitrogen oxides from the electric energy producing industries, and combustion gases from automobiles. Burning of fuels produce smoke, flue gas and sulfur dioxide. Due to increasing use of natural gas for household heating installations, the situation in the residential areas has improved since natural gas has almost no sulfur content and burns without smoke formation. A measurement network on a national scale is planned with the building of 5 fully automated measuring stations to monitor and record the level of air pollution. An experimental measuring station at Twente was built to decide the locations and number of the measuring stations.

17056 APTIC NO. 35398

Carpenter, Kathleen E.

A STUDY OF THE FAUNA OF RIVERS POLLUTED BY LEAD MINING IN THE ABERYSTWYTH DISTRICT OF CARDIGANSHIRE. *Ann. Appl. Biol. (London), 11(1):1-23, April 1924. 16 refs.*

The fauna of certain streams in the Aberystwyth district of Wales was examined with respect to substratum, water acidity, and correlation with pollution by lead mining and lead washing operations. Such operations affected the rivers by the discharge into the waters of galena particles in all stages of divisions and by the formation of lead salts in diffusible form through chemical interaction with natural water. The correlation of fauna lists with water analyses determined that poverty of fauna, especially fish, was always accompanied by the presence of lead salts. (Author summary modified)

17057 APTIC NO. 35711

Chaput, H.

URBAN TRANSPORATION AND EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1971. 8 refs. (Presented at the Society of Automotive Engineers, Mid-Year Meeting, Montreal, Quebec, June 7-11, 1971, Paper 710559.)*

Measures taken by one urban transit company to reduce emissions from diesel buses are reviewed. Major stress is placed on the use of instruments, not only for inspection, diagnosing, and correcting obvious faults which cause blue and black smoke, but also for monitoring engine deterioration and indicating when motor and torque oil should be changed. Since engine wear and fuel dilution are important causes of troublesome emissions, a fixed replacement and rebuild policy is followed, and motor oil is regularly tested for viscosity. Exhaust emissions have been reduced by needle valve fuel injectors, while ground-level fume concentrations and ground-level noise have been controlled by use of vertical stacks with aspirators. Air starters enable engines to be shut off during layovers without repeated heavy battery drain when starting again.

17058 APTIC NO. 35985

Cooke, N. E., R. M. Cooper, and R. H. Andres

POLLUTION CONTROL AT A LARGER FERTILIZER COMPLEX. *Safety Air Ammonia Plants, vol. 13:23-28, 1971.*

Although the pollution abatement facilities at a fertilizer complex of Canadian Industries Ltd. were expected to enable air quality regulations to be met, CIL decided that it would be desirable to monitor its operations to ensure that this was being accomplished, to indicate the malfunction of pollution control equipment, and to enable repair of such equipment before environmental damage could occur. A survey sampling grid was set up to measure fluorides, sulfur dioxide, and particulate matter. The major source of fluoride emission to the atmosphere is the diammonium phosphate plant, where phosporic acid is reacted with ammonia. Ground level concentration data are indicated, and a model to simulate any combination of circumstances by mathematical means is presented. A venturi scrubber was installed between the ammonia scrubber and the dust scrubber stack, using gypsum pound water as the scrubbing medium, thus lowering the fluoride emissions. Water quality monitoring, particulate emissions, ammonia plant condensate, and solid waste disposal are also discussed.

17059 APTIC NO. 35061

Coq, Jacques

ACTION BY THE FRENCH GAS INDUSTRY. *(Action de l industrie gaziere francaise). Text in French. Pollut. Atmos. (Paris), vol. 13:19-21, Oct. 1971.*

Natural gas from Lacq contains four mg/t sulfur which, in comparison with gas generated from solid or liquid fuel of 0.7% sulfur content, is 170 times less. Natural gas ningue which supplies the Paris region is 20,000 times less polluting than heavy fuel with a three percent sulfur content. Nitrogen oxide emissions from natural gas expressed in g/Kth increase with the size of the installation (from home heating installations to electric power plants) from 100 g/Kth to 700 g/Kth. For solid or liquid fuels, this emission is double. At the present state of technology, natural gas used in small installations is by far the least polluting fuel. Pollution caused bv automobiles can be reduced significantly by the use of liquefied natural gas especially in urban areas. Carbon monoxide emissions are thus reduced by 90%, hydrocarbons are reduced by 66%, and nitrogen oxides by 50%. French taxicabs have been powered by compressed gas for several decades. The extension of the use of natural gas to the generation of energy by turbines by industry will, in the future, contribute markedly to pollution control. The development of natural gas batteries would make available a source of energy generating no nitrogen oxides and a minimum of other pollutants.

17060 APTIC NO. 35066

Cox, L. A. and H. E. Worster

AN ASSESSMENT OF SOME SULFUR-FREE CHEMICAL PULPING PROCESSES. *Tappi, 54(11):1890-1892, Nov. 1971. 34 refs. (Presented at the Technical Association of the Pulp and Paper Industry, New York, Feb. 22-25, 1971.)*

Non-sulfur pulping methods to reduce emissions from the pulping process are reviewed. Nitric acid pulping delivers rapid delignification at low temperatures and atmospheric pressure, relatively high pulp yield, and useful by-products, but the chemicals are more costly, pulp strength is inferior to that of kraft pulps, and the pulp is darker in color. Single-stage alkali-oxygen pulping methods yield pulps of higher quantities and brightness values but require large chemical applications. Pulp yields in pulping with chlorine dioxide are high, but the high hemicellulose content of these pulps, high electrical costs, and corrosion problems may make the process uneconomical. The process would also emit chlorine dioxide which is very toxic and may be explosive in certain ratios with the air. (Author abstract modified)

17061 APTIC NO. 36012

Crompton, David and Dennis Gilbert

ESTIMATING THE IMPACT OF TRAFFIC ON THE ENVIRONMENT. *Surveyor - Local Govt. Technol., 138(4148):51-52, Dec. 1971.*

Figures resulting from noise and pedestrian delay measurements in Edinburgh were used to calculate the environmental capacities of Edinburgh streets and access roads. The significance of the figures for all sites was expressed by means of an Environmental Deficiency Index (EDI), i.e., the ratio of off peak-hour traffic volume to calculated environmental capacity. In addition to giving an approximate indication of the adequacy of environmental conditions for noise and pedestrian delay, the EDIs also give a direct indication, in traffic terms, of the order of magnitude of any traffic over or under-loading at a site. Smoke and carbon monoxide were also measured. The EDIs were used to assess the acceptability of four alternate transportation schemes.

17062 APTIC NO. 35887

Cross, Frank L., Jr., J. Ronald Lawson, Charles C. Miesse, and William D. Sitman

ENVIRONMENTAL ASPECTS OF SITE SELECTION FOR A PETROLEUM REFINERY. *Rhode Island Univ., Kingston, Coll. of Engineering and Greater Providence Chamber of Commerce, R. I., Proc. North Eastern Regional Antipollution Conf., 4th, Kingston R. I., 1971, p. 161-177, (July 13-15.)*

Recently, there has been considerable interest in the siting of petroleum refineries in the northeast U.S. Air pollution, water pollution, solid waste management, and noise problems inherent in refinery operations are considered, as well as the methodology which currently exists for studying the impact on the local environment. Included is a detailed flow sheet of a 100,000 barrel-per-day refinery indicating the sources of potential pollution problems. The quantities and types of emissions and pollutants coming from these sources are documented. (Author abstract modified)

17063 APTIC NO. 35901

Davies, D. J. I. and R. Harrison

DESTRUCTION OF NON-UNIFORM ORGANIC REFINERY WASTES. *Chem. Process. (London), 17(11):25-26, 28, Nov. 1971.*

A recently-installed petroleum refinery incinerator effectively destroys two waste products with widely varying chemical and physical properties. The first is a sour gas containing hydrogen sulfide, carbon dioxide, and nitrogen; the second is a liquid stream of maleic anhydride. The temperature inside the incinerator is maintained at 1300 F to achieve complete destruction of the effluents. The support fuel control valve receives its signal from a thermocouple placed behind a baffle. One of the functions of the baffle is to increase the turbulence of the gases inside the main plenum chamber of the incinerator. Operation and control of the incinerator, and the specially designed multi-jet burner which consists of a number of ceramic tubes arranged to form a square, are described.

17064 APTIC NO. 35994

Doty, W. I. and L. J. Olejnik

MOBILE TEST VEHICLE MEASURES EXHAUST EMISSIONS ON THE ROAD. *Automotive Eng., 80(1):68-72, Jan. 1972. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Annual Meeting, Detroit, Jan. 10-14, 1972.)*

To support laboratory results, a mobile, instrumented test vehicle was developed for measuring and recording automobile performance parameters, exhaust emissions, and system temperatures under actual road conditions. Tests were run at idle-drive, at steady speeds on a chassis dynamometer, and at steady speeds on the road. In general, test results showed that engine tune-up parameters can have a major influence on vehicle exhaust emissions and fuel economy. Specifically, the following effects were verified in the steady-speed tests: Spark retard reduces hydrocarbon, nitrogen oxide, and carbon monoxide emissions and increases fuel consumption. The nitrogen oxide reduction is due to the lowering of peak combustion temperatures and pressures. Restricted positive crankcase ventilation valve flow increases hydrocarbon and CO emissions and fuel consumption while reducing nitrogen oxide emissions at low speeds. The loss in the latter is probably due to the lower combustion temperatures in the rich mixture. Increases in fuel-air ratio increase hydrocarbon and CO exhaust and fuel consumption at low speeds. Decreased nitric oxide emissions normally accompany rich mixture adjustment. Changes in CO emission generally govern changes in total pollutant emissions, due to the overwhelming amount of CO in the exhaust.

17065 APTIC NO. 35981

Eick, H.

INDUSTRIAL FIRING SYSTEMS. *(Industriefeuerungsanlagen). Text in German. Oel Gasfeuerung, 16(12):1162-1169, Dec. 1971.*

Appearance and properties of an oil flame depend on the residence time, the temperature, the velocity ratio, cracking/oxidation, the oxygen supply, and catalytic influences. Hydrocarbons must be burned while they are suspended in a gas flow. If a flame or part of an oil mist impacts on a wall, an air deficiency forms locally which leads to soot formation. Carbon particles which are cooled below 800 C are emitted as soot from the flame. Soot loads itself with sulfur trioxide from the waste gas and converts sulfur dioxide catalytically to SO3 if the temperature is below 360 C and if oxygen and water vapor are present in the waste gas. For a reduction of emissions, the cracking and oxidation processes must be controlled. The oxidation can be accelerated by improvement of the mixture formation. The residence times must be so short that cracking and the formation of hydrocarbons is avoided or the combustion products must remain in the combustor until they are burned completely.

17066 APTIC NO. 35417

Eilertsen, Donald E.

BERYLLIUM. *Bureau of Mines Minerals Yearbook. Washington, D. C., Government Printing Office, 1969, 6p. 9 refs.*

Beryllium is examined with respect to legislation and government programs on stockpiles, domestic production, consumption, uses, prices, specifications, foreign trade, and technological factors. Bertrandite was heralded as a new commercial source of beryllium. Production of beryllium metal and beryllium oxide was moderately large in 1969 and outputs of beryllium-copper master alloy and beryllium aluminum were second highest on record. A new fabrication technique to make thinner, longer, and stronger beryllium tubes, new methods for producing beryllium shapes, and processes to strengthen and improve the physical characteristics of the metal are discussed.

17067 APTIC NO. 35376

Eke, P. W. A. and J. H. Walker

GAS AS AN ENGINE FUEL. *Trans. Inst. Mar. Eng., 82(4):121-138, April 1970. 16 refs.*

The properties required of a fuel gas, particularly in as engine, and the advantages of natural gas compared with other available gases are discussed. The development of the gas engine from early times is reviewed and the reasons for its decline in popularity are considered. The rise of the dual-fuel engine in the sewage treatment industry and the modern gas engine in the United States is described and their relative merits compared. Reference is also made to natural gas as a fuel for gas turbines and steam boilers. Gas and dual-fuel engines are described. Experiments in the use of liquid natural gas as a fuel in the transport industry are outlined and some possible applications of liquid natural gas, including use of the cold effect, are given. (Author abstract modified)

17068 APTIC NO. 35590

Elliot, Martin A. and Roger F. Davis

COMPOSITION OF DIESEL EXHAUST GAS. *SAE (Soc. Automot. Engrs.) Quart. Trans., 4(3):330-346, July 1950. 16 refs. (Presented at the Society of automotive Engineers National Diesel-Engine Meeting, St. Louis, Mo., Nov. 2, 1949.)*

The relationship between air/fuel ratio and the products of incomplete combustion is discussed. A relation observed between the concentration of aldehydes and the odorous and irritating character of diesel exhaust gas suggested that removal of aldehydes should reduce both properties. Tests with water as a scrubbing medium showed that aldehydes cannot be removed completely by such a system. However, aqueous sodium sulfite solutions inhibited by the addition of hydroquinone to prevent oxidation of the sulfite removed substantially all of the aldehydes and produced significant reductions in odor and irritation for extended periods of time. The application of data on exhaust-gas composition to the determination of operating and performance data on diesel engines is discussed and methods of calculation and relevant equations are given. (Author abstract modified)

17069 APTIC NO. 35564

Elliott, L. F. and T. M. McCalla

AIR POLLUTION FROM AGRICULTURE. *Nebraska Univ., Lincoln, Extension Service; Dept. of Agriculture, Washington, D. C.; and Nebraska Univ., Lincoln, Coll. of Home Exonomics, Proc. Explor. Nebr. Pollut. Probl. Lincoln, Nebr., 1971, p. C-1 - C-6. 29 refs. (April 22.)*

The major atmospheric pollutants from agriculture are examined. Dust due to wind erosion and agriculture-related industries (alfalfa mills, lime kilns, cotton gins), allergens from weeds and crops, pesticides, smoke from open burning of crop residues, odors from animal wastes and processing of agricultural products, and gases released by animal wastes (carbon dioxide, carbon monoxide, hydrogen sulfide, ammonia, and methane) contributed heavily to air pollution. Possible control methods include improved tillage practices and cropping methods; electrostatic precipitators and dust filters for industrial usage; weed control programs; controlled spraying; treatment facilities for odor prevention; and chemical control of animal waste odors.

17070 APTIC NO. 35199

Felt, A. E. and R. V. Kerley

ENGINES AND EFFECTS OF LEAD-FREE GASOLINE. *Society of Automotive Engineers, Inc., New York, 8p., 1970. 19 refs. (Presented at the Society of Automotive Engineers, Mississippi Valley Section Meeting, Oct. 22, 1970, Paper 710367.)*

Problems posed by the use of lead-free gasoline in conventional passenger cars are discussed. Under heavy-duty operation, severe exhaust valve seat wear can occur. This will eventually result in one or more valves remaining open with extremely high exhaust emissions. Combustion-chamber deposits formed in the absence of lead are typically more carbonaceous. These deposits have a higher heat capacity than lead deposits and the result, after extended mileage, is higher octane number requirements for engines operated on leaded gasolines. The use of aromatic blending stocks to increase the octane number of nonleaded fuels increases undesirable exhaust emissions. Amounts of phenols, benzaldehydes, total aromatic aldehydes, and polynuclear aromatic hydrocarbons in the exhaust are directly proportional to the aromaticity of the fuel. In addition, the photochemical reactivity of automobile emissions can be increased by as much as 38%. (Author abstract modified)

17071 APTIC NO. 35124

Fenner, David and Joseph Klarmann

POWER FROM THE EARTH. *Environment, 13(10):19-26, 31-34, Dec. 1971. 19 refs.*

Production of electricity from the heat of the earth s interior (geothermal energy) is one alternative to nuclear and fossil-fueled power plants. To produce electricity from this heat, the basic process is as follows: steam is collected in wells; the steam is used to drive rotary engines (turbines) in a power plant; and the turbines drive generators, which, in turn, make electricity. Geological sources of heat, exploration for geothermal areas, geothermal wells, and geothermal power generating plants are discussed. Costs are cited for exploration, well-drilling, power plants, environmental considerations, operation, and maintenance. World geothermal resources are indicated, and recommendations are made. Geothermal steam sources could emit hazardous substances such as hydrogen sulfide. Therefore, environmental problems would have to be controlled.

17072 APTIC NO. 35786

Fischer, William H. and J. P. Lodge, Jr.

PARTICLE PRODUCTION BY POLYMER PYROLYSIS: EFFECT OF CARBON MONOXIDE. *J. Appl. Polymer Sci., 15(9):2091-2101, Sept. 1971. 4 refs.*

The effects of carbon monoxide and water vapor on the production of condensation nuclei during the pyrolysis of various polymers were investigated. The results were expressed in terms of an E/C ratio, where C is the concentration of condensation nuclei produced thermally in filtered room air and E is the concentration in the presence of an experimental variable. Without exception, water vapor increased and CO decreased the E/C ratio. The combined effect of water vapor and CO was variable and unpredictable. The latter phenomenon and the dependence of E/C on E and C indicate that a simple field method for determining CO in ambient air is not at hand or close to realization. The results do show that any polymer, heated in air, may experience enhanced reactivity with low concentrations of trace impurities in air.

17073 APTIC NO. 35353

Gagliardi, J. C., E. E. Weaver, and C. S. Wodkowski

EFFECTS OF NON-LEADED FUELS ON EXHAUST HYDROCARBON COMPOSITION AND CATALYST LIFE. *Am. Chem. Soc., Div. Petrol. Chem., Preprints, 16(2):E65-E69, March/April 1971. 23 refs.*

The effects on non-leaded or low-leaded gasolines and fuel additives on the level of total hydrocarbon emissions, hydrocarbon composition of exhaust, photochemical reactivity of hydorcarbons in exhaust, and particulate emissions have been investigated, along with the use and effects of catalytic control systems. Currently marketed non-leaded fuels were similar in composition to regular leaded fuels and therefore emitted exhaust of similar composition and photochemical reactivity. Hydrocarbon emissions with non-leaded fuels would increase no more than 10% due to combustion chamber deposits, while with leaded fuels they would increase as much as 35%. Olefin content of the exhaust increased with olefin content of fuels. An increase in aromatic content indicated a slight decrease in total hydrocarbon emissions. Aromatic aldehydes were in the exhaust only if aromatic hydrocarbon were determined in the fuels. Catalytic devices had a relatively short life with leaded fuels; they permitted the control of hydrocarbons and hydrocarbon reactivity, aldehydes, polynuclear aromatic hydrocarbons, and carbon monoxide to low levels. Lead derived particles were a major portion of the particulate matter in the exhaust. (Author summary modified)

17074 APTIC NO. 35249

Galuskinova, V.

THREE, FOUR-BENZPYRENE DETERMINATION IN THE SMOKY ATMOSPHERE OF SOCIAL MEETING ROOMS AND RESTAURANTS. A CONTRIBUTION TO THE PROBLEM OF THE NOXIOUSNESS OF SO-CALLED PASSIVE SMOKING. *Neoplasma, 11(5):465-468, 1964. 9 refs.*

Air samples collected in a Prague restaurant in summer and fall were fluorometrically analyzed for 3,4-benzpyrene. In the summer, when customers were fewer in number and the rooms were well aired, the 3,4-benzpyrene concentration was 0.62 gamma/100 cu m, or not in excess of the values measured in Prague ambient air in summer. Fall values were 2.82 gamma to 14.4 gamma/100 cu m vs 0.28 gamma to 4.6 gamma/100 cu m measured in Prague air each fall from 1960 through 1962.

The magnitude of the values points up the danger of tobacco smoke inhalation by a non-smoker in the presence of smokers.

17075 APTIC NO. 35563

Gilbert, Richard E.

THE CONTRIBUTION OF INDUSTRY TO NEBRASKA S POLLUTION. *Nebraska Univ., Lincoln, Extension Service; Dept. of Agriculture, Washington, D. C.; and Nebraska Univ., Lincoln, Coll. of Home Economics, Proc. Explor. Nebr. Pollut. Probl. Lincoln, Nebr., 1971, p. B-1 - B-12. 12 refs. (April 22.)*

Air pollution and major industrial sources in Nebraska are reviewed. The major atmospheric contaminants included carbon monoxide, unreacted hydrocarbons, sulfur oxides (sulfur dioxide and sulfur trioxide), particulate matter (smoke, dust, soot), nitrogen oxides, oxidants, and specific secondary pollutants. Automobiles, the largest contributors of CO, hydrocarbons, and NOx, accounted for nearly half of the pollution; 73.4% of the SOx from stationary combustion sources, primarily soft coal use, including domestic heating and power generation. Other major sources of pollution included iron and steel plants, petroleum, rubber, and plastics industries, oil refineries, and incineration. Measurements of Lincoln determined the particulate concentration increased from 55 to 72 micrograms/cu m in 1968-1970; average SO2 concentration was 0.001-0.005 ppm with a maximum of 0.019 ppm. Oxidant (ozone) levels averaged at 0-0.013 ppm with a recorded maximum of 0.075 ppm. Management priorities for monitoring pollutants were designated. Control methods are mentioned.

17076 APTIC NO. 35445

Gilbert, R. R., J. R. Harvey, G. E. Heuer, and L. J. Lawson

FLYWHEEL FEASIBILITY STUDY AND DEMONSTRATION. (FINAL REPORT). *Lockheed Missiles and Space Co., Sunnyvale, Calif., Ground Vehicle Systems Div., Air Pollution Control Office Contract EHS 70-104, Rept. LMSC-D007915, 188p., April 30, 1971. 19 refs.*

NTIS: PB 200143

The feasibility of the flywheel as a means of attaining low-emission propulsion systems for urban vehicles was investigated with respect to performance evaluation and design studies. Operating requirements were correlated with vehicle specifications for a family car, a commuter car, a city bus, and a delivery/postal van. Performance specifications, power requirements, and configuration tradeoffs were determined for flywheel operation. Flywheel/heat engine hybrid drives were suitable for all four vehicles. The spark ignition engine was best in this configuration. Based on emission data and standards, the flywheel/hybrid family car achieved low emission levels of nitrogen oxides, hydrocarbons, and carbon monoxide in the tests.

17077 APTIC NO. 35925

Greenberg, J. H.

SYSTEMS ANALYSIS OF EMISSIONS – THE IRON FOUNDRY INDUSTRY. *Chem. Technol., 1(12):728-736, Dec. 1971. 2 refs. (Presented at the American Institute of Chemical Engineers, Cincinnati, Ohio, 1971.)*

Characteristics and sources of emissions in various iron foundry departments are presented, in order to set priorities for research and development that will lead to improved emission control capabilities. A general, simplified process flow for all iron foundries includes raw material storage, preparation and charging, metal melting, molding, pouring, and shakeout, sand conditioning and reclamation, cleaning, heat treating and finishing, and coremaking. Of techniques available to control foundry pollutants, particulate collection equipment systems are the most significant. These systems include dry centrifuges, wet collectors, catalytic combustion, fabric filters, and electrostatic precipitators; they vary widely in design, capabilities, cost, and application. Specific emissions for the various processes include dust, vapors, smoke, hydrocarbons, fly ash, metallic oxides, sulfur compounds, carbon monoxide and fumes. Particle size, concentrations, and control costs are mentioned. Cupola furnaces, electric arc furnaces, and boilers also cause pollution.

17078 APTIC NO. 35919

Griffing, M. E., A. R. Maler, J. E. Borland, and R. R. Decker

APPLYING A NEW METHOD FOR MEASURING BENZO(A)PYRENE IN VEHICLE EXHAUST TO THE STUDY OF FUEL FACTORS. *Am. chem. Soc., Div. Petrol. Chem., Preprints, 16(2):E24-E31, March 1971. 19 refs. (Presented at the Los Angeles Meeting, March 28-April 2, 1971.)*

The effect of fuel aromaticity and tetraethyl lead content on benzo(a)pyrene emissions from cars using prototype fuels and cars without emission control devices was investigated. Complete experimental procedures and test data are discussed. In general, the BaP emitted was increased with an increase in fuel aromaticity; tetraethyl lead content had no effect on BaP emissions. Using a car not equipped with emission control devices, a positive straight line relationship was determined between fuel aromaticity and BaP emissions. The nonaromatic portion of the fuel formed some BaP emissions during combustion. The BaP emissions varied more during cold cycle operation than during hot cycles. Of the two alternates for obtaining octane number, low aromatic leaded fuels produced less BaP than higher aromatic unleaded fuels. A new tracer injector and sampling system was used for the tests. (Author conclusions modified)

17079 APTIC NO. 35897

Gutow, Bernard S.

AN INVENTORY OF IRON FOUNDRY EMISSIONS. *Mod. Casting, 61(1):46-48, Jan. 1972.*

Estimates of iron foundry emissions in 1969 were made during a study of melting and non-melting operations. Amounts of particulate and gaseous emissions were determined by molten iron production. Federal data were obtained on total 1969 gray iron casting tonnage for each of nine geographical regions, and the percents of casting tonnage produced from iron melted in cupolas, electric arc, and other furnaces were calculated for each region. The high concentration of iron foundries in the Great Lakes states accounts for almost 70% of the national molten iron production and approximately 72% of the particulate emissions emitted from melting and non-melting operations. About 73% of the carbon monoxide emitted from iron foundries occurs in the Great Lakes states, and an additional 10% of carbon monoxide emissions occurs in the east south central states for a combined total of almost 83%. The results of the total nationwide emissions estimated to come from iron foundries are tabulated. (Author summary modified)

17080 APTIC NO. 35980

Haeusler A. and W. Koehnlein

BUTANE, A NEW FUEL FOR ASPHALT MIXING PLANTS. *(Butan, ein neuer Brennstoff fuer Asphaltmischanlagen). Text in German. Bitumen-Teere-Asphalte-Peche, 22(11):476-478, Nov. 1971.*

The fuel usually used for drying and heating in asphalt mixing plants is fuel oil. The fuel has proved to be absolutely reliable and economical, but because of the sulfur content, sulfur dioxide is emitted. Thus tests have been carried out with butane as a possible substitute. The fuel proved to be as efficient as fuel oil and renders a much cleaner waste gas. This has some impact on the dust collection. The water outlets at the wet collector did not clog any more due to the cleaner gas, the sludge which is left is oil-free, and a higher efficiency of the wet collector could be achieved. The latter can be explained by the lack of oil shielding the particles from the water. All maintenance and cleaning which was necessary with fuel oil heated driers became unnecessary.

17081 APTIC NO. 35128

Hall, H. T.

THE ROLE OF THE STEEL FOUNDRY INDUSTRY IN ENGENDERING BETTER STANDARDS OF HEALTH, SAFETY AND WELFARE IN STEEL FOUNDRIES. *Brit. Foundryman, vol. 64:283-292, Aug. 12 1971. (Presented at the Steel Castings Research and Trade Association, Annual Conference, Newcastle, England, June 1971.)*

The role taken by the steel foundry industry in engendering better standards of health, safety, and welfare in steel foundries is described. A new steelmaking process has been developed which depends upon the injection of iron oxide, e.g., millscale, for the removal of carbon and other metalloids. One of the principal advantages is that metalloids can be removed without fume and thus without thy need for fume collection or fume cleaning equipment. Ventilation has contributed to diminishing the risk of steel foundry workers contracting respiratory diseases. Particular problems pertain to silica dust, hydrogen and exposion hazards, and other respirable dusts. Dust sampling is mentioned. Personal protective devices must be capable of reducing dust concentrations to safe levels while also being acceptable to the wearer. The generation and suppression of noise in steel foundries are discussed. Legislation and dust surveys in steel foundriess are also described.

17082 APTIC NO. 35224

Halley, James H. and Bruce E. McNay

CURRENT SMELTING SYSTEMS AND THEIR RELATION TO AIR POLLUTION. *Preprint, American Inst. of Chemical Engineers New York and Inst. Mexicano de Ingenieros Quimicos, 20p., 1970. 5 refs. (Presented at the American Institute of Chemical Engineers and Institute Mexicano de Ingenieros Quimicos, Joint Meeting, 3rd, Denver, Colo., Aug. 30-Sept. 2, 1970.)*

The non-ferrous smelting operations, using metallic sulfides as feed material, are briefly described. These include copper, lead, and zinc smelting. Conditions and the nature of waste gas streams are discussed in relation to extraction and recovery of sulfur. Major problems of high temperatures, unclean gases, and low sulfur oxide concentration are noted. Possible changes in equipment and processes are discussed, as well as the manufacture of sulfuric acid from relatively strong sulfur dioxide waste gas. (Author abstract modified)

17083 APTIC NO. 35455

Heller, Arnold and Erdwin Lahmann

PROPERTIES OF THE AIR. *(Eigenschaften der Luft). Text in German. Handb. Lebensmittelchem., vol. 8:1242-1318, 1969. 370 refs.*

Air and air pollutants, their chemical composition, and their physical properties are discussed. The principal sources for the various pollutants are listed, and their behavior described independent of climatic and weather conditions. The effect of these pollutants on humans, animals, and plants is dealt with in considerable detail. The subjects covered include the normal components of air, i.e., nitrogen, oxygen, rare gases, carbon dioxide, water vapor, ozone, hydrogen peroxide; maximum permissible concentrations in indoor working areas (MAK figures) for 40 varieties of gaseous pollutants and 20 types of chemical substances in the form of dust or aerosols; gaseous pollutants, such as water vapor, carbon dioxide, carbon monoxide, ozone, sulfur dioxide, sulfur trioxide and sulfuric acid, chlorine and hydrochloric acid, nitric oxide, ammonia, hydrofluoric acid and other fluorine compounds, hydrogen sulfide, carbon disulfide, hydrocyanic acid, hydrocarbons, aldehydes, ketones, and amides; particulate pollutants, comprising dust, soot, aerosols; sources for dust generation in nature, from roads, from heating installations, industries; sedimented dust; airborne dust; live air pollutants, such as viruses, bacteria, algae, fungi, and pollen; and radioactive aerosols.

17084 APTIC NO. 35638

Hemeon, Wesley C. L.

GAS CLEANING EFFICIENCY REQUIREMENTS FOR DIFFERENT POLLUTANTS. *J. Air Pollution Control Assoc., 12(3):105-108, March 1962. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 54th, New York, June 11-15, 1961.)*

Knowledge is now available to identify the particular air pollution problems of a community and to derive engineering specifications for the performance of gas cleaning equipment, stack heights, or other control measures based on permissible ground concentrations. Dust weight emission rates, stack gas smoke and haze units, stack gas dustfall, incinerator paper ash, corrosion potential, and odors are discussed. Concentrations of a gaseous contaminant, usually expressed as ppm in the ambient ground level atmosphere, demand the same kind of units to express stack gas concentrations which, when multiplied by the stack gas flow rate, give the emission rate in cubic feet per hour. The common description of smoke and haze ground concentration in the units COHs per foot of air demands the same kind of units for a description of smoke concentration in stack gases and consistent units for total rate of emission of smoke. Measurement methods appropriate to the same kind of measurement at ground level as in stack gases are needed.

17085 APTIC NO. 35712

Hietbrink, Earl H., Gary L. Winebrener, and Romeo R. Witherspoon

DUEL BATTERY ELECTRIC POWERPLANT. *Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1971. 7 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710234.)*

A lead-acid and zinc-air dual battery power plant is described with specific emphasis on the zinc-air batteries, electronic control concept, and vehicle performance and evaluation. The zinc-air battery provides power for normal road loads, while the lead-acid battery provides additional power for acceleration and peak demands. Power flow from the batteries to the motors is regulated by two synchronized d-c choppers that are controlled by logic. The lead-acid battery has a 24 ampere-hour rating and consists of seven series-connected cells. The zinc-air batteries are of the replaceable anode type, and require the exchange of both the zinc anodes and the 33% potassium hydroxide electrolyte after each discharge cycle. The batteries are arranged in two parallel strings of series-connected cells. For constant speed cruise operation, the zinc-air batteries provided all the required power. However, the mechanically rechargeable batteries are not considered practical for vehicular application. Continuous research and development must be directed toward evolving an electrically rechargeable concept.

17086 APTIC NO. 35477

Hinkamp, J. B., M. E. Griffing, and D. W. Zutaut

AROMATIC ALDEHYDES AND PHENOLS IN THE EXHAUST FROM LEADED AND UNLEADED FUELS. *Am. Chem. Soc., Div. Petrol. Chem., Preprints, 16(2):E5-E11, March/April 1971. 32 refs.*

The effect of aromatic hydrocarbons on the concentration of aromatic aldehydes and phenols in the exhaust of cars operating on various fuels and determined test cycles was investigated. Two fuels of equal octane level, leaded and unleaded, were tested for the effects of the removal of lead antiknocks. Although total aldehyde concentration was not significantly altered by fuel composition, the concentrations of total aromatic aldehydes and benzaldehyde increased with the aromatic content of the fuel. Phenol concentration increased with fuel aromaticity in both the cold and hot cycle tests.

17087 APTIC NO. 35283

Hohenemser, Kurt H.

AIRCRAFT IN THE BALANCE. *Environment, 13(10):42-49, Dec. 1971. 5 refs.*

Commercial applications, air pollution, noise pollution, safety hazards, and policy alternatives are assessed for short-take-off-and-landing type aircraft and vertical-take-off-and-landing type aircraft. If STOL/VTOL craft could be operated without the extensive idling and taxiing periods of the conventional aircraft, air pollution from carbon monoxide and hydrocarbons could be reduced to a fraction of its present amount. Unless the STOL/VTOL noise levels can be kept below 90 PNDB (perceived noise in decibels), it is doubtful that residential communities will accept STOL/VTOI traffic. Several noise control measures are cited. The safety aspect is crucial for future STOL/VTOI operation because the aircraft require smaller air fields, and because their route structure covers, to a large extent, built-up areas.

17088 APTIC NO. 35866

Hubbert, M. King

THE ENERGY RESOURCES OF THE EARTH. *Sci. Am., 224(3):61-70, Sept. 1970.*

The three main sources of energy at the surface of earth are solar radiation; thermal energy, which is conveyed to the surface from the warmer interior; and tidal energy derived from the combined kinetic and potential energy of the earth moon-sun-system. The total power influx from the three sources is 173,035 times 10 to the 12th power watts, of which 99.98% is solar radiation. The smallest portion of solar radiation goes to photosynethesis. Dead plants and animals buried in the earth give rise to fossil fuels, containing stored solar energy from millions of years past. When the fossil fuels are exhausted, probably within a few centuries, five other sources of energy are possibilities: solar energy used directly, solar energy used indirectly, tidal energy, geotermal energy, and nuclear energy. With the growing technological capability for exploiting these sources, energy resources not at hand are sufficient to sustain an industrial operation of the present magnitude for another millennium or longer.

17089 APTIC NO. 35691

Huber, E. W.

MEASURING THE TRAPPING EFFICIENCY OF INTERNAL COMBUSTION ENGINES THROUGH CONTINUOUS EXHAUST GAS ANALYSIS. *Preprint, Society of Automotive Engineers, Inc., New York, 10p., 1971. 20 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710144.)*

The trapping efficiency, i.e., effective cylinder charge, of internal combustion engines was determined through continuous exhaust gas analysis. For gasoline engines, the oxygen content of the exhaust gas was monitored; for diesel engines, n-butane was used as tracer gas. The method can be used on two-stroke and four-stroke cycle engines. The theoretical basis of the method is discussed and the limits of application are shown. Test results, obtained with engines especially prepared for zero scavenging and for controlled scavenging with air only or with an air/fuel mixture, are quoted. (Author abstract modified)

17090 APTIC NO. 35326

Huber, Manfred

THE BMW EXPERIMENTAL ELECTRIC AUTOMOBILE. *(Ein Elektro-Experimentier-Auto von BMW). Text in German. Automobiltech. Z. (Stuttgart), 73(9):342-346, 1971. 9 refs.*

The tudor BMW limousine model 1600 was converted to a battery-powered electrical automobile for city cruising. The car has an acceleration rate of maximum eight seconds from zero to 50 km/hr, a maximum cruising speed of 80 km/hr, and can carry a maximum excess load of 350 kg. This last stipulation is a limiting factor; if exceeded, the car loses its maneuverability. The electric engine is located in place of the gear-shift and activates an unchanged differential gear by means of an intermediary gear and a shortened drive-shaft. A traction lead battery was chosen as a source of power. Normal starter batteries with high power density have too short a life to be commercially useable, but for experimental purposes, the car was equipped with twelve 12 V starter batteries connected in series. Varta 6 Duu 8 batteries were used. The 144 voltage requires comparatively light cables for intensities from 30 to 200 A and thus poses no insulation problems. The batteries are under the hood. The Bosch motor weighs 85 kg, has a power 0output of 43.5 HP, and an efficiency of 0.86. The pollution-free car has no vibration problems, is externally comparatively noiseless but has internal humming noise problems which are not easily controlled. The range of the car is only 73 km, and even less in stop-and-go traffic.

17091 APTIC NO. 35350

Hughes, Leonard H.

GAS DISPERSAL UNIT. *(Texaco Inc., New York, N. Y.) U. S. Pat. 3,592,122. 4p., July 13, 1971. 3 refs. (Appl. June 26, 1971, 7 claims).*

Waste gases from petroleum production can be disposed of by burning in flares. However, it is far less expensive to merely dilute the gas below combustible concentration. An apparatus for diluting flue gases prior to their discharge into the atmosphere is examined. The gas dispersal unit comprises a rotatable inductor located in the flue. A source of a gaseous diluting medium, e.g., air, is positioned upstream of the inductor to mix with waste gas passing through the inductor prior to the waste gas contacting the inductor blades. The waste gas is passed upward through a perforated manifold which functions as a condensing unit. A part of the gas flow is passed through constrictions in the manifold upper side and then to the inductor; the reminder of the gas is condensed and passed from the manifold to a condensate collector. (Author abstract modified)

17092 APTIC NO. 35472

Jackson, William D., Michael Petrick, and James E. Klepeis

A CRITIQUE OF MHD POWER GENERATION. *Trans. ASME (Am. Soc. Mech. Engrs.), 92(3):217-230, July 1970. 55 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/Pwr-12.)*

Magnetohydrodynamic electric power generation is a promising new technique for upgrading the efficiency of converting heat into electricity. The concept was explored intensively but on a small scale during the past ten years, and the initial enthusiasm in it was confirmed. Its utilization in base-load plants, in addition to increasing overall efficiency, can also lead to important reductions in the adverse environmental effects of thermal and air pollution. The projected efficiencies of large dual-cycle systems are initially in the range of 47-50%. In an MHD system, energy is extracted from a flowing electrically conducting fluid. The fluid may be either a seeded plasma or a liquid metal. The major technological problems and progress in the three major cycles (open cycle, closed-cycle plasma, and closed-cycle liquid metal) are discussed in depth. In the open-cycle system, proposed engineering solutions for the major problems in the generator and auxiliary equipment are detailed and the experience gained from the operation of a succession of generators is summarized. In the case of the closed-cycle plasma system, progress is being made toward developing a generator with the requisite conversion efficiency. The potential for developing liquid-metal MHD systems for commercial application is considered. (Author abstract modified)

17093 APTIC NO. 35757

Jirous, F.

CALCULATION OF FLUE GAS AND TUBE WALL TEMPERATURES DURING START-UP OF A STEAM GENERATOR. *(Berechnung der Rauchgas - und Rohrwandtemperaturen beim Anfahren eines Damperzeugers). Text in German. Brennstoff - Waerme - Kraft, 22(9):442-446, Sept. 9, 1970. 3 refs.*

The analytical difference procedure and the Runge-Kutta numerical procedure allow the computation of tubular wall and flue gas temperatures at the starting point of a steam generator. These temperatures are computed as time-dependent functions, and their computations are concerned with uncooled heating surfaces. The analytical difference procedure is applied whenever jump fluctuations of flue gas temperature and flue gas flow rates occur with time. This analytical procedure cannot be applied for constant conditions. The differential equations should be solved numerically according to the Runge-Kutta procedure for these latter conditions.

17094 APTIC NO. 35065

John, Matt K.

LEAD CONTAMINATION OF SOME AGRICULTURAL SOILS IN WESTERN CANADA. *Environ. Sci. Technol., 5(12):1199-1203, Dec. 1971. 19 refs.*

The content of nitric acid soluble lead among 700 soil samples, mostly from agricultural soils in British Columbia, was related to proximity to industrial and population centers. Soluble lead was immobilized in surface horizons and ranged from 0.5 to 180.4 ppm in the agricultural soils. The soluble lead content in surface samples collected near a battery smelter was as high as 59,580 ppm. Fractionation of lead into total, native, and soluble forms was useful in assessing the degree of soil pollution. Since plant availability of lead may depend on many factors other than soil lead content, it is difficult to conclude whether some of the high levels of lead present in these soils could result in excessive accumulation in plants. (Author summary modified)

17095 APTIC NO. 36011

Jonasson, I. R. and R. W. Boyle

GEOCHEMISTRY OF MERCURY AND ORIGINS OF NATURAL CONTAMINATION OF THE ENVIRONMENT. *Can. Mining Met. Bull. (Montreal), 65(717): 32-39, Jan. 1972. 60 refs.*

The trace quantities of mercury in the natural environment, while helpful and important to exploration geologists, may accumulate in the biosphere in levels that present problems for ecologists and health authorities. Available data on mercury content in materials of geologic interest are summarized and average normal values are given for rocks, ores, minerals, solids, sediments, waters, and plants. Figures are also presented for the mean normal mercury content of fossil fuels such as coal and crude oil. An idealized geochemical cycle for mercury is displayed. The cycle indicates inter-movements between hydrosphere, atmosphere, biosphere, pedosphere, and lithosphere when mercury compounds are in solid, dissovled, sorbed, or gaseous forms. Mercury migration processes are not yet fully understood in terms of the physical and inorganic chemistry of the element. The fundamental lack of knowledge of migration processes of all trace elements has led to the virtual explosion of pollution problems involving them.

17096 APTIC NO. 35383

Keshen, Albert S.

SOLID RUBBER WASTES. *Ind. Wastes, 4(1):14-15, Jan. 1959.*

A prefabricated steel-framed, brick-lined, two-chamber incinerator incorporating an oil burner in each chamber was used insure complete combustion of rubber wastes at a manufacturing plant. Temperatures from 1600 to 2400 F are maintained by the use of the two oil burners. Because of the heterogeneous nature of the waste, which includes some asphalt products, the usual 2100 F which provides operation free of objectionable smoke and odor. The unit is hand fed with a capacity sufficient to handle over 20 tons of waste daily. Burning is started and maintained in the primary chamber by one of the oil burners. Unburned gases and particulate matter pass to the secondary chamber where they continue to burn. If a sufficiently high temperature is not self-sustaining in this chamber a second burner is provided to carry out complete combustion. The capital investment in the incinerator is about $40,000. 0

17097 APTIC NO. 35198

Kester, Dana R.

FLUORIDE ANALYSIS IN THE NORTHWEST ATLANTIC OCEAN. *Rhode Island Univ., Kingston, Narragansett Marine Lab., Office of Naval Research Contract N00014-68-A-0215-003 TR-71-2, 14p., April 1971. 10 refs.*

NTIS, DDC: AD 723237

Fluoride chlorinity ratios were determined in sea water samples collected at various depths along a transect from the Grand Banks to the eastern side of the Mid-Atlantic Ridge. The ratio is slightly higher along the southeast flank of the Grand Banks than elsewhere on the transect toward the Mid-Atlantic Ridge. It is unlikely that the high values of fluoride observed at several stations are due to analytical inconsistency with the remaining data, because standard fluoride samples were run with each set of samples. If the high values in the vicinity of the Grand Banks are the result of the southward transport of anomalous fluoride water previously found, it is evident that fluoride is not a sensitive tracer of water movement in this region over distances of 1700 km. Measurements of fluoride were also performed on rain water, sediment pore water, and fumerole water. (Author abstract modified)

17098 APTIC NO. 35685

Khan, I. M.

FORMATION AND COMBUSTION OF CARBON IN A DIESEL ENGINE. *Preprint, Inst. of Mechanical Engineers, London (England), 8p., 1970. 6 refs. (Presented at the Symposium on Diesel Engine Combustion, London, England, April 7-9, 1970, Paper 3.)*

Effects of the shape of the injection diagram, injection period, and injection nozzle on diesel engine smoke were studied for a wide range of injection timings and engine speeds on a one liter direct-injection type engine cylinder. Cycle temperatures were also varied by raising inlet air temperature and by introducing water mixed with diesel fuel. An analysis of these results shows that the exhaust smoke level is mainly determined by the concentration of soot at the end of heat release, i.e., any subsequent combustion of the net soot release before exhaust valve opening is unimportant. The net soot release in a diesel engine cylinder, for a given fuel, is controlled by the amount and rate of diffusion burning and the flame temperatures. (Author abstract)

17099 APTIC NO. 35089

Kiigemagi, Ulo and L. C. Terriere

LOSSES OF ORGANOPHOSPHORUS INSECTICIDES DURING APPLICATION TO THE SOIL. *Bull. Environ. Contamination Toxicol., 6(4):336-342, 1971. 4 refs.*

Losses of pesticide during application to the soil, a potential source of environmental contamination, were investigated. Losses of pesticides during application and during the first day after application were measured. Experimental procedures and test data are described. Analyses determined a 13-40% loss of pesticides due mainly to evaporation or drift during spraying.

17100 APTIC NO. 35057

Kinsley, H. and D. Pickthall

USE OF FIBREGLASS REINFORCED PLASTICS IN A BOILERHOUSE CHIMNEY. *Chem. Eng., no. 244:426-427, Dec. 1970.*

A fiber reinforced plastics chimney was constructed, the first 35 ft within the boilerhouse structure itself and the remaining 65 ft as free standing. The design was based on 550 F maximum temperature under full load conditions with a normal operating temperature in the range 450/500 F. Design calculations are cited.

17101 APTIC NO. 35459

Kita, Nobuyaki, Yoshiya Fuse, and Hisashi Iwai

TEST OF SMOKE DEVELOPEMENT FROM SYNTHETIC MATERIALS USED FOR RAILWAY VEHICLES. *Railway Tech. Res. Inst. Quart. Repts., 11(1):233-235, 1970.*

NTIS: PB 197898

Synthetic materials were heated in an electric furnace and the reduction in visibility in the adjoining smoke chamber was measured by an illuminated photoelectric cell. Based on the maximum value of the attenuation coefficient during the heating process, the materials were classified according to smoke development. Urethane foam rubber, polyethylene foam, chloroprene rubber, and soft polyvinyl chloride foam developed smoke at relatively low temperatures. Higher temperatures were required for smoke development in block-type synthetics. Glass fiber-reinforced unsaturated polyster resin developed less smoke than non-reinforced samples. Soft polyvinyl chloride block had a tendency to develop more smoke than hard polyvinyl chloride block.

17102 APTIC NO. 35052

Kiyoura, Raisaku

ENERGY AND POLLUTION -- DEVELOPMENT OF POLLUTION-FREE FUEL. *Chem. Economy Eng. Rev., 3(11):25-32, Nov. 1971. 1 ref.*

The world s energy consumption has been increasing at an average annual rate of four to five percent, while Japan s consumption has been expanding at a rate of more than 10%. Coal, petroleum, natural gas, and electric power consumption figures for major countries are presented tabularly. In Japan, the rapid rise in energy demand has sharply increased the nation s dependence on imported raw materials such as oil, coking coal, and iron ore in the energy consuming sectors. The rise in energy consumption and the increase in industrial wastes are contributing to air pollution. Efforts are being made with added momentum, however, to secure low-sulfur crude, to develop desulfurization techniques, to generate atomic energy on a commercial basis, and to import a large volume of liquefied natural gas. Nationwide emissions and emission sources are indicated for the United States. Sulfuric acid fallout is discussed; the air stream which moves from south to north carries acidic air from central Europe and blows it north. Lead compounds in automobile exhaust are also mentioned. Sulfur oxide control processes include activated carbon, Reinluft method, manganese oxide, alkalized alumina, limestone, scrubbing, ammonia, oxidation, absorption, and adsorption. Japanese efforts against pollution and Japanese standards are given.

17103 APTIC NO. 35597

Knudsen, H. L.

DIESEL ENGINE EXHAUST GASES. *Power Plant Eng., 43(6):391-392, June 1939.*

Exhaust gas from a Cummins Diesel engine was chemically analyzed. Within the normal operating range of the engine tested, the carbon monoxide based on iodine liberation, did not exceed 0.03%. With an oxygen surplus as small as 1%, which represents a 30% overload, the CO is still below the best result that can be obtained with a gasoline engine. Determinations of acrylic aldehyde seemed to bear no relationship to load, speed, or oxygen surplus; it is unlikely that they represent actual values. However, the characteristic odor of aldehyde was absent. The amount of sulfur dioxide in the exhaust gas depends upon the percentage of sulfur in the fuel and also on the load. Carbon dioxide increased with an increase in speed, reflecting an increase in frictional horsepower. Water vapor in the exhaust gas is usually of little importance.

17104 APTIC NO. 35788

Koide, Minoru and Edward D. Goldberg

ATMOSPHERIC SULFUR AND FOSSIL FUEL COMBUSTION. *J. Geophys. Res., 76(27):6589-6596, Sept. 20, 1971. 19 refs.*

Chloride and sulfate concentrations in ice samples from the Greenland ice sheet were spectrophotometrically determined and compared with previously reported values. The analyzed samples were collected in 1964-1965 and were primarily from the Camp Century area and from a virgin site 80 km east-southeast Camp Century. The determined values are uniformly higher than published values; but regardless of the the values used, substantial changes in the sulfate-chloride ratios do not appear until 1964-1965. The sulfur dioxide released in the combustion of fossil fuels appears to be competing during the last decade with natural processes such as volcanoes and the oxidation of hydrogen sulfide derived from organic matter. In recent glacial strata, the amount of sulfate co-varies with the amount of lead, suggesting similar source areas and atmospheric paths for the two pollutants.

17105 APTIC NO. 35641

Kreyberg, Leiv

THREE:FOUR-BENZPYRENE IN INDUSTRIAL AIR POLLUTION: SOME REFLEXIONS. *Brit. J. Cancer (London), vol. 13:618-622, 1959. 17 refs.*

To investigate the hydrocarbon content of the air of industrial plants, gasmeters equipped with filter papers were installed in two gasworks and an electrochemical factory at representative sites where the workers are regularly employed. For further comparison, seasonal changes of 3,4-benzpyrene in the air of towns in England and Wales and in Norway are noted. The figures indicate that the air in the retort house of the Oslo Gasworks contains 3,4-benzpyrene in amounts corresponding to some 5000 cigarettes daily for a worker with a 40-hr week. There seems to be a straight line correlation between the number of cigarettes smoked and the risk of developing epidermoid and small cell anaplastic carcinomas. Evidence relating lung cancer with 3,4-benzpyrene is discussed.

17106 APTIC NO. 35965

Kurata, E., A. Ishifuku, T. Imai, H. Uchida, K. Kitazono, T. Sato, G. Sugiura, H. Nakamura, K. Narita, S. Fujinuma, Y. Masuda, and T. Yasuda.

HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM. *(Taiki osen yori mita kucho reinetsu gen enerugi: zadankai). Text in Japanese. Kuki Chowa-Eisei Kogaku (J. Japan Soc. Heating Air Conditioning Sanitary Engrs.), 45(11):882-904, Nov. 1971.*

The definition of the total energy system and its sociological and economical necessity are discussed. City planning and thermal energy, demand and consumption of petroleum fuels, fuel sulfur content, possibility of using kerosene as an energy source, and the composition of various heavy oils are mentioned. Desulfurization methods and problems are discussed. Also included are the gas supply system in Tokyo, the gas regulations and programs in Osaka, the demand for electricity and electricity production, the use of electric heat, economic comparisons of various heat energy sources, the methods of selecting energy sources, prices of gas and petroleum, the use of electricity at night, problems of heat pumps, and future fuel problems. Although the use of hydrogen for desulfurization is known to be effective, the method requires high temperature and high pressure and there is no ideal metal for a catalyst. The direct desulfurization method which was developed in Japan is extremely difficult and only three such systems are in operation. However, the rate of desulfurization by this method is 1.5%, against 1.0% of the indirect method, and the future potential is greater. From the crude oil containing 1.6% sulfur, 43% residual oil containing 3.0% sulfur can be obtained; by the direct desulfurization method, the sulfur content can be reduced to 1.0% without losing any of the 43% quantity

17107 APTIC NO. 35743

Landberg, Arthur

AIR POLLUTION FROM OIL FUELS. *(Luftforurensing fra oljefyrte anlegg). Text in Norwegian. Tek. Ukeblad (Oslo), 118(42):37-38, Oct. 14, 1971.*

By 1980, fuel oil will equal 65% of Norway s energy sources. Six million tons of fuel oil will be used yearly, which can result in the doubling of sulfur pollutants, unless adequate measures are taken to stop such a development. In 10 years, one quarter of a million tons of sulfur dioxide will pollute the air. Research is needed on measurement and control methods. Combustion smoke contains nitrogen, carbon dioxide, water, sulfur dioxide, sulfur trioxide, ashes, and soot. The SO2, SO3, ash, and soot are harmful to man, animals, plants, and materials, During oil firing, most sulfur in the fuel oxidizes to SO2, while one to three percent oxidizes to SO3. During the 70 s, oil-firing power plants emitted 30,000 tons of SO2 yearly, which corresponds to 24% of the total SO2 emission in Norway in 1966. Pollution damages and control costs Norway millions of dollars each year. Sulfur dioxide can be reduced by using fuel oils with low sulfur content or by desulfurization of the flue gases. High stacks increase pollution dispersion. Mechanical and electrostatic collectors can desulfurize smoke. Abatement and standards are discussed.

17108 APTIC NO. 35338

Lee, G. K., F. D. Friedrich, and E. R. Mitchell

EFFECT OF FUEL CHARACTERISTICS AND EXCESS COMBUSTION AIR ON SULPHURIC ACID FORMATION ON A PULVERIZED-COAL-FIRED BOILER. *J. Inst. Fuel, 40(320):397-405, Sept. 1967. 11 refs. (Presented at the Canadian Symposium on the Science and Technology of Coal, Ottawa, Ontario, March 31, 1967.)*

The effects of sulfur content of coal, cation content of coal ash, and excess combustion air on the corrosion potentail of boiler flue gases were investigated with respect to measruements of carbon dioxide, oxygen, and carbon monoxide in the flue gases; acid dew point; rate of acid buildup; sulfur trioxide, sulfur dioxide, and particulate matter in the flue gases; sulfuric acid deposited in the presence of fly ash; SO2 and SO3 in unfiltered gases; and weight of ash slagged in each run. Experiments with coal containing six and seven percent sulfur determined that SO3 concentrations, acid dew point, rate of buildup, and neutralization by fly ash influenced corrosion potential. Equilibrium data relating only acid concentration and theoretical acid dew point cannot be applied to the corrosion rate under dynamic boiler conditions where flue gas constituents are continually deposited. Corrosion potential was minimal or nonexistant at less than one percent oxygen but high above three percent oxygen in the flue gas. (Author abstract modified)

17109 APTIC NO. 35077

Loebsack, Theo

THE ENVIRONMENT IN DANGER (4). THE POLLUTED AIR. *(Umwelt in Gefahr (4). Die verpestete Luft). Text in German. Kosmos (Stuttgart), 67(8):337-341, Aug. 1971.*

In West Germany the permissible limit of carbon monoxide concentration in air at 1.5 meters is 0.01%. However, the CO content at busy intersections, if there is no wind, can amount to about 0.03% caused by automobile exhausts. When inhaled, the CO combines with the hemoglobin of the blood and prevents the blood from providing the body with sufficient oxygen. Depending on quantities absorbed, symptoms of intoxication can vary from headaches, drop of blood pressure, and spasms to death by impaired breathing and heart failure. About 20 million tons of pollutants per year are emitted into the air in the area of the German Federal Republic, composed of 2.5 million tons of dust, 2.5 million tons of nitrogen oxides, 3.0 million tons of hydrocarbons, 5.0 million tons of sulfur oxides, and 7.0 million tons of CO. In the United States, the corresponding total emission is estimated at 130 million tons, 60% of which originates from automobile exhausts. Meteorological observations and statistics show that bellshaped or hemispherically formed haze develops over all industrial towns more than 10 km in diameter. The cause is the phenomenon of air over the warm town center rising as in a chimney, then at a certain height it spreads in the manner of a fountain and sinks at the outskirts of the town. Winds exceeding certain velocities will disperse the bells. Dust concentrations in industrial areas can go as high as 4000 particles/cu mm, which is one thousand times more than in normal country air. During weekdays, industrial cities receive on an average five to ten percent more rain than surrounding areas, due to the fact that dust particles act as nuclei for condensation, causing clouds and fog. A medium size industrial city receives 30% less sunlight and 90% less ultraviolet radiation than the countryside around it. Sulfur dioxide is one of the most dangerous air pollutants. A five year study in the city of New York has shown a direct relation between the average daily rate of mortality and the SO2 content of the air.

17110 APTIC NO. 35078

Loebsack, Theo

THE POLLUTED AIR (2). *(Die verpestete Luft (2)). Text in German. Kosmos (Stuttgart), 67(9):379-382, Sept. 1971.*

By photochemical processes, sulfur dioxide is changed into sulfur trioxide. Ozone can form in smog under the influence of sunlight, and then combine with other pollutants, becoming an irritant to the eyes and the respiratory organs. Ozone inhaled for an extended period of time can cause fatal lung edema. Between 1900 and 1960 the concentration of carbon dioxide and dust in the air rose from an average of 290 ppm to 330 ppm. A meteorologist in Munich has calculated that an increase of 10% CO2 causes the average temperature of the atmosphere to go up by 0.3%. This in turn creates an increase of the water vapor content, the cloud cover becomes denser, with a consequent detrimental effect on plant photosynthesis due to the weakened light energy, resulting in reduced formation of oxygen by the plants. The exhausts from gasoline engines produce, apart from carbon monoxide, unsaturated hydrocarbons, nitric oxides, lead compounds, and the carcinogen 3,4-benzopyrene. An interesting aspect with combustion engines is the fact that they consume vast amounts of oxygen. One study reveals that nobody in the United States would be alive now, if the human demand for oxygen were covered solely by the oxygen produced by the plants in the U. S. In actual fact, one third of the demand is derived from sources outside the boundaries of the continental U. S., for instance from the oxygen produced by the plant plankton of the Pacific Ocean. Pollution of the air by fluorides is caused by emissions from metallurgical plants of the aluminum, iron, and non-ferrous metal industries, ceramics industries, and plants manufacturing phosphorus and phosphate fertilizers.

17111 APTIC NO. 35467

Lucas, D. H.

THE ATMOSPHERIC POLLUTION OF CITIES. *Intern. J. Air Pollution, vol. 1:71-86, 1958. 9 refs.*

The pollution levels of sulfur dioxide (and smoke) likely to be produced by the thousands of domestic fires in large cities is assessed. A mathematical formula is given so that city concentrations can be estimated if the rate of emission, the wind speed, and the size of the city are specified. Results indicate that the major part of the pollution measured in large cities can be attributed to domestic fires even though the concentrations produced by a single fire are negligible. The worst pollution occurs about a mile downstream of the center of the city and pollution levels decrease extremely rapidly outside the city boundary, particularly when averaged over a range of wind directions. When the atmosphere is stable, ground-level concentrations tend to be high. The effect of fog is complex and uncertain. It appears likely, however, that sulfur dioxide (and smoke) is removed by the fog and that the time constant is between 8 and 20 hours. (Author abstract modified)

17112 APTIC NO. 35844

Luten, Daniel B.

THE ECONOMIC GEOGRAPHY OF ENERGY. *Sci. Am., 224(3):165-175, Sept. 1971.*

The exploitation of an energy resource covers seven operations: discovery of the resource, harvest, transportation, storage, conversion, use, and disposal. The sequence of these steps varies for different commodities; in some cases there are alternate sequences. Major constraints on use of energy commodities are posed by location of the resource, transportation costs, and the state of technology for converting energy. The flexibility and intricacy of different energy systems (e.g. electricity, gas, and liquid fuels) are compared. While the ultimate use of energy resources is governed by the ratio of the benefit to the cost, cultural variables also influence energy patterns. These include changes in social patterns, the constraints of tradition, governmental policies, and local fads and preferences. High technological societies do not necessarily have a high ratio of work to total energy. Fuel oil, natural gas, wood, coal, hydroelectric power, nuclear power, wind, and solar power are discussed.

17113 APTIC NO. 35508

Masek, Vaclav

NEW DATA ON THE CHARACTERISTICS OF PARTICULATE EMISSIONS FROM A METALLURGICAL COKING PLANT. *(Nove poznatky of vlastnostech tuhych emisi z hutni koksovny). Text in Czech. Hutnicke Listy (Prague), 26(8):542-548, 1971. 19 refs.*

The adsorption and ion-exchange characteristics, the electrokinetic potentials, the magnitude of adsorption of some gases and vapors, and the contact catalytic potential of samples of fly dust emitted by the coking plant Nova Hut Klementa Gottwalda in Ostrava-Kuncice were determined. Test results revealed that the adsorption power of these dusts did not even reach that of ordinary filter paper. The dusts had comparatively low ion-exchange power with sodium, potassium, and ammonium. The electrokinetic potentials of particles were positive but very low; the coarsest dust particles had the biggest electrical charge, the finest particles the smallest electrical charge in the acid range. Adsorption of gases and of vapors was low. The potential of the dusts as contact catalysts derived from their ability to accelerate the decomposition of hydrogen peroxide was of a very low order. Thus the fly dust from the coking plant under scrutiny was found to be of low reactivity.

17114 APTIC NO. 35998

Matsue, Takahiro

SOME PROBLEMS IN THE USE OF LPG FUEL FOR FOUR CYCLE ENGINES. *(4-saikuru enjin no L.P.G. nenryo ni yoru mondaiten ni tsuite). Text in Japanese. Preprint, Science Council of Japan, Tokyo, p. 149-152, 1971. (Presented at the Symposium on Combustion, 9th, Tokyo, Japan, Dec. 3-4, 1971.)*

When using petroleum gas as a fuel, the power output tends to decrease in proportion to the consumption of fuel. Compared to the same amount of gasoline, LPG s ignition temperature is higher and the combustion speed is faster, but the output is smaller. It was conjectured that some incompletely burned gas overflowed the outside of the engine and burned in the exhaust pipe. The amount of exhaust gas was measured at the exit of the combustion room in order to determine the proportion of external combustion. Since it was difficult to measure incompletely burnt gas, the amount of the air, carbon monoxide, and carbon dioxide were measured. The consumption of LPG was 50% above the consumption of gasoline, and yet the power output was less than 50%. When using LPG for an automobile internal combustion engine, the combustion speed is sometimes greater than that of gasoline, but if the speed is increased greatly, the amount of CO increases. From the standpoint of air pollution control, it is necessary to examine and determine a suitable combustion speed which will satisfy both power output and the need for pollution control.

17115 APTIC NO. 35168

McCabe, Louis C.

AIR POLLUTION REGULATIONS IN LOS ANGELES COUNTY. *Lead Industries Assoc., New York, Proc. Lead Hyg. Conf., Chicago, Illinois, 1948, p. 102-11. 2 refs. (Nov. 15-16.)*

Los Angeles air pollution regulations affecting metallurgical industries and from an investigation of air pollution problems in ferrous and nonferrous industries in the area are summarized. Smoke cannot exceed Ringelmann No. 2 for more than 3 min/hour, and no contaminant can be emitted that is as opaque as smoke at Ringelmann No. 2. Particulate matter cannot exceed 0.04 grains/cu ft at the point of discharge. Lead and zinc oxides are restricted to 0.035 grains/cu ft and sulfur compounds to 0.2% by volume (calculated as sulfur dioxide). The average loss due to volatilization and recondensation for brass foundries and smelting operation is about 1% of the melt charged. A loss of this magnitude is in violation of the present rules. Foundries handling copper-lead, magnesium, aluminum, and high nickel-brass alloys will be within legal limits, provided good foundry practices are followed. For the ferrous industry the percent loss is 0.5 to 0.9. Most of the time, the ferrous industry violates the present law on stack loading and opacity. Three types of equipment can be applied at nonferrous installations at reasonable expense: fabric filters, mechanical scrubbers, and packed towers. Installation costs will run from $.25 to $1.50/cu ft of gas handled.

17116 APTIC NO. 35693

McCabe, Louis C.

ATMOSPHERIC POLLUTION. *Ind. Eng. Chem., 45(6):107A-108A, June 1953. 1 ref.*

Atmospheric conditions in the San Francisco Bay area were summarized. In San Francisco there are complaints of two types of odors: odors localized in the Islais Creek area and attributed to packing house, fish cannery, and fertilizer plant operations and odors in the Richmond, Sunset, Pacific Heights, and Nob Hill areas which are comparable to smog. Residents of Napa, Solano, and Contra Costa Counties, complain that, under unfavorable weather conditions, there are objectionable odors from the industrial plants located along the shores of San Pablo and Suisun Bays. The discharge of pollutants from operations located between Palo Alto and South San Francisco are, in general, blown over the bay and cause no complaints from residents of San Mateo County other than in the Redwood City area. A number of reports indicate there is frequent circling of the wind and a localized reduction of visibility with some odor nuisance in the location. There is reason to believe that a large portion of the nuisance to residents of San Mateo County is attributable to burning of trash and garbage dumps. Dumps are located where the volume and drift-direction of the smoke are readily discerned. Savings resulting from smoke elimination in Pittsburgh amount to 27 million dollars.

17117 APTIC NO. 35599

McCauley, Robert F.

THE PRESENT STATUS OF COMPOSTING AND ITS AIR POLLUTION ASPECTS. *J. Air Pollution Control Assoc., 6(4):233-237, Feb. 1957.*

Modern composting is an aerobic process in which waste organic materials are ground or shredded and then either piled in windrows or fed into the decks of a digester. Oxygen from the air penetrates into the voids of the material where it dissolves in the liquid moisture films and is carrried to aerobic bacterial organisms. In composting, the potential for creating odor and other nuisances is high. The grinding of garbage in fully enclosed areas, unless fully automatic, is most offensive to the workmen conducting the operation. Some ventilation is required; the more the ventilation, the greater possibility of creation of air pollution problems. During the early stages of composting a definite acrid or acid odor is noticeable. Later, the odor becomes musty, and may become extremely objectionable to the inhabitants of the plant area who must be faced with the plant odor for long time periods. Heavy moisture vapors are a serious consideration during periods of cold weather operation. Odor problems can probably be overcome by the use of tall stacks, high-temperature burning of air, and similar processes. However, these devices limit the economic value of composting and will probably have to be avoided if the process is to compete with incineration and other conventional methods. The most hopeful approach appears to be a recapture of water and odor vapors.

17118 APTIC NO. 35318

McJones, Robert W. and Reine J. Corbeil

NITROGEN OXIDES IN THE EXHAUST OF METHANE FUELED AUTOMOBILES. *Am. Chem. Soc., Div. Petrol. Chem. Preprints, 16(2):E60-E63, March-April 1971. 4 refs. (Presented at the American Chemical Society, Div. of Petroleum Chemistry, Meeting, Los Angeles, Calif. March 28-April 2, 1971.)*

An attractive operating regime for engines with gaseous fuel involves lean mixtures near 125% theoretical air, slightly retarded spark timing, and vacuum advance not connected. Typical automobile emission levels obtained with this regime are summarized, along with typical values for natural gas (methane or propane) engines adjusted for peak performance, rather than an emission-performance comprise, and for 1970 gasoline engines. In exchange for a 20% loss in maximum horsepower, lean natural gas operation yields a 90% reduction in nitrogen oxides and reactive hydrocarbons and a 99% reduction in carbon monoxide. Also summarized are nitrogen oxide levels in the exhaust of a large transit bus operating on natural gas. Natural gas operation with lead mixtures and retarded spark timing does not cause valve burning or valve seat wear, or affect general driveability. It will extend oil and spark plug life.

17119 APTIC NO. 35236

Minet, Ronald G.

A TECHNOLOGICAL SOLUTION TO AIR POLLUTION PROBLEMS - SYNTHETIC FUEL. *Preprint, American Inst. of Chemical Engineers, New York, and Inst. Mexicano de Ingenieros Quimicos, 26p., 1970. 15 refs. (Presented at the American Institute of Chemical Engineers and Institute Mexicano de Ingenieros Quimicos Joint Meeting, 3rd, Denver, Colo., Aug. 28 -Sept. 1, 1970.)*

The use of a synthetic fuel, methanol, as a substitute for gasolines in internal combustion engines or for any fossil fuels in stationary combustion systems to reduce air pollution is examined. The basic characteristics of methanol, relative performance compared with gasoline, use in a fuel cell, methanol production, costs, transport, and comparative emission are reviewed. Methanol can be produced from essentially any hydrocarbon raw material; it is readily shipped and easily stored and handled. It has good octane rating and when used as a component in gasoline up to 25% by volume, improves the anti-knock rating. Projected emission values estimate a decrease in emissions of nitrogen oxides, unburned hydrocarbons, and carbon monoxide.

17120 APTIC NO. 35547

Moore, A.

ROUND DOWNDRAUGHT KILNS: CONVERSION TO GAS FIRING. *J. Inst. Fuel, 43(356):355-358, Sept. 1970.*

The firing by gas of beehive kilns which are conventionally hand-fired by coal was studied. A liquefied petroleum gas was utilized as fuel and a Hotwork high-pressure atmospheric type burner was applied to each firehole. Trials have shown a reduction in the firing cycle of up to 38% with additonal benefits in the reduction of emissions and the ability to maintain a predetermined firing schedule and kiln temperature profile. (Author abstract modified)

17121 APTIC NO. 35474

Moser, C. E.

AUTOMOTIVE EMISSIONS RESEARCH AND THE COORDINATING RESEARCH COUNCIL PROGRAM. *Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1971. 2 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710075.)*

The Coordinating Research Council program on vehicle emissions consists of some thirty projects with a three-year projected cost of more than $10 million. The functional Air Pollution Research Advisory Committee and the Project Manager oversee these studies, encompassing the fields of engineering, atmospheric chemistry, and medicine. Results are being utilized by industry and government to reduce the level of emissions now contaminating the atmosphere. Engineering studies are basically structured to determine the interaction of equipment design and fuel composition on vehicle emissions. Medical research is directed to investigating the effects of motor vehicle emissions on health, human performance, and behavior. (Author abstract modified)

17122 APTIC NO. 35584

Netschert, Bruce C.

THE ECONOMIC IMPACT OF ELECTRIC VEHICLES. *Preprint, Society of Automotive Engineers, Inc., New York, 6p., 1971. 6 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710187.)*

Complete overnight electrification of all ground transportation in the United States is assumed in order to provide a measure of the maximun possible impact of electric vehicles. The impact on the electric utility industry would be to increase total load by roughly one-half; thus complete electrification of ground transportation at any realistic pace would pose no serious difficulties. Similarly, the automobile manufacturing and ancillary industries, although subject to change, would find no serious difficulty in adapting. The impact on the petroleum industry, however, would be serious, for about one-half of its markets would disappear. Complete electrification of ground transportation could lead to troublesome adjustment problems within the industry and in the regions in which it is important. An especially bothersome problem would exist in public finance. Without a transfer of the motor fuel tax funds to electricity consumed in transportation, government revenues would be adversely affected. It is not clear, however, how the transfer could be made in a way that would be both equitable and administratively feasible. (Author abstract)

17123 APTIC NO. 35113

Niklasson, Rune

AIR CLEANING - NO UTOPIA ANY LONGER. REPORT ON THIS YEAR S ELMIA EXHIBITION. *(Luftrening -*

ej langre nagon utopi rapport fran arets Elmia-utstallning). Text in Swedish. Kem. Tidskr., 83(9):46-50, 1971.

The Elmia exhibition attracted 200 exhibiters from ten countries in early September in Jonkoping. A number of industries in Sweden which envision large investments for the next couple of years for environmental protection and air pollution control are discussed. Investigations carried out in Sweden show that sulfur dioxide emissions are of large and still increasing volume, and nitrogen oxides are of next importance. Large volumes of dust are also put into the atmosphere. Outlines are given of the projects concerning environmental protection provided by the cellulose industry. Great emphasis is laid upon charting of the emission sources. Half of the total SO2 emission in the cellulose industry is created by the sulfite industry, mainly due to the pulp production on a calcium basis. There are two different solutions to this problem: switching to a magnesium basis, or flue gas cleaning. An experimental flue gas cleaning equipment was tested in continuous operation. The chemical and food industries are mentioned. A new generation of pollution measuring instruments for detecting low concentrations without surveillance is described. These instruments apply chemiluminescent substances, flame-photometric detectors, and gas chromatographs. A brief account is given of the problems and possibilities involved in dust measurements.

17124 APTIC NO. 35818

Padrta, F. G., P. C. Samson, J. J. Donohue, and H. Skala

POLYNUCLEAR AROMATICS IN AUTOMOBILE EXHAUST. *Am. Chem. Soc., Div. Petrol. Chem., Preprints, 16(2):E13-E23. March 1971. 8 refs. (Presented at the Los Angeles Meeting, March 28-April 2, 1971.)*

Polynuclear aromatic hydrocarbons (PNAH) in auto exhaust were spectrometrically analyzed following sampling with thermal gradient traps, benzene extraction, and benzene concentration. To learn more about the origin of PNAH in exhaust, fuel, and motor oil compositions were varied. Also, both new and old engines were used. Addition of C8 aromatics to indolene did not significantly alter the level of PNAH in the exhaust, but addition of C8 aromatics to isooctane noticeably increased the level of PNAH in exhaust over isoocatane without added aromatics. Lead-free and leaded Indolene produced essentially similar PNAH exhaust levels. Larger differences in PNAH levels were observed for different engine wear conditions than for different fuels. A catalytic converter operating at higher than normal space velocities reduced PNAH in exhaust by 90+% and C8-C10 alkylbenzenes by 95+%.

17125 APTIC NO. 35484

Peters, Bruce, Harrison Sigworth, Jr., P. S. Myers, and O. A. Uyehara

THE 1970 CLEAN AIR CAR RACE AND THE UNIVERSITY OF WISCONSIN ENTRIES. *Am. Chem. Soc., Div. Petrol. Chem., Preprints, 16(2):E73-E86, 1970. 9 refs.*

Two spark ignition engine powered cars, fueled by unleaded gasoline and liquid petroleum gas, and equipped with extensive intake and exhaust system modifications for low emissions are examined against the results of a Clean Air Car Race. The modifications included retarded spark-timing, blowby emission control, special carburetion, catalytic muffler, exhaust port air injection, exhaust gas recirculation, thermal reactor, and changed air-fuel ratio. Test description, procedures, and results and control equipment used are discussed. Concentrations of unburned hydrocarbons, carbon monoxide, nitrogen oxides, and particulates emitted were determined.

17126 APTIC NO. 35278

Peters, John M. and Raymond L. H. Murphy

HAZARDS TO HEALTH: DO IT YOURSELF POLYURETHANE FOAM. *Am Rev. Respirat. Disease, vol. 104:432-433, 1971. 9 refs.*

Breathing zone concentrations of toluene diisocyanate (TDI) during use of five commercial polyurethane foam kits were determined by the Marcali method. That the concentrations were at or near recommended ceiling values (0.01 and 0.02 ppm) for TDI suggests a hazard if polyurethane foam is used indiscriminately. Cases of acute bronchospasm have occurred at concentrations below both recommendations in persons with no previous history of allergic reactions.

17127 APTIC NO. 35123

Pierrard, J. M. and R. A. Crane

AUTO EXHAUST – LEAD VS AROMATICS. *Hydrocarbon Process., 50(9):142-146, Sept. 1971. 17 refs. (Presented at the Air Pollution Control Association, Atlantic City, N. J., June 29, 1971.)*

Laboratory and field tests were conducted to determine the effect of particulate emissions in vehicle exhaust on atmospheric soiling and visibility degradation. Leaded and unleaded gasolines were compared using 1969, 1970, and 1971 model automobiles. In the first phase of the investigation, cars were operated on a programmed chassis dynamometer on leaded and unleaded fuels of both high and low aromatic content, and the soiling and visibility degradation effects of the particulate matter in the diluted exhaust were determined. In the second phase, two fleets of cars were driven in the controlled atmosphere test space afforded by an idle traffic tunnel. Soiling and visibility degradation were more severe with the unleaded fuel at both high and low aromatic content. Unleaded gasoline caused 84% more degradation of light transmission than leaded, and soiling was 57% worse for unleaded gasoline.

17128 APTIC NO. 35635

Reckner, L. R., W. E. Scott, and W. F. Biller

THE COMPOSITION AND ODOR OF DIESEL EXHAUST. *Proc. Am. Petrol. Inst., Sect. III, vol. 45:133-147, 1965. 11 refs. (Presented at the American Petroleum Institute Division of Refining, Midyear Meeting, 30th, Montreal, Quebec, May 10, 1965.)*

Sampling and analysis techniques are described for determining light hydrocarbons, nitrogen oxides, formaldehyde, acrolein, total aldehydes, total particulate, and polycyclic aromatic hydrocarbons in diesel exhaust, using infrared spectrometry, chromatography, fluorescence spectrophotometry, colorimetry, and mass spectrometry. Using these techniques, results are reported on the composition of exhaust from two diesel engines, a two and a four-cycle, under a variety of operating conditions. Smoke ratings using different techniques are also reported and compared to total particulate results. No correlation was found between smokemeter ratings and particulate loadings at other than black smoke conditions. Human panel observations of exhaust odor are being made as part of a continuing program, but no panel data are reported. (Author abstract modified)

17129 APTIC NO. 35292

Rice, Richard L. and Neil H. Coates

FLUID BED COMBUSTION: SUITABILITY OF COALS AND BED MATERIALS. *Power Eng., 75(12):36-39, Dec. 1971. 1 ref.*

Lignite, antrhacite, and six bituminous coals ranging from high to low volatile were tested for fluid-bed combustion characteristics at bed temperature of 1600 F, fluidizing velocity of three fps, and 10% excess air. Carbon utilization, ash distribution, bed materials loss, and overall heat transfer coefficients in the boiler were determined. Bed depths of 15 or 16 in were sufficient for good combustion, provided carryover solids were recycles. With solids recycling and at bed temperatures above 1500 F, carbon utilization was 99% or more. Without solids recycling, carbon utilization decreased by about 10%. A high-volatile bituminous coal and a medium-volatile bituminous coal, both with ash contents over 20%, were difficult to burn at the desired conditions. With these coals, there was a large increase in ash content of the bed, indicating that ash from the coals could be used as bed material. Usually the ash content increased only slightly. Bed losses were small when mullite, zirconia, or fused alumina were bed materials. In most cases, heat transfer coefficients from bed to surface varied directly with solids heat capacity.

17130 APTIC NO. 35305

Schiller, R. A.

MODERN METHODS OF REFUSE DISPOSAL IN A CHEMICAL WORKS. *Sulzer Tech. Rev. (Switz.), 53(2):83-90, 1971. 1 ref.*

A new energy generation plant was built in the Muttenz works of Sandoz Ltd., Basle, Switzerland; its prime duty is to supply the research and production centers with hot water and process steam. When planning the energy plant for heat generation, it was necessary to consider industrial waste disposal of various packing materials, used oils, solvents, and plant residues from medicine extraction. The steam generation wing, waste burning wing, storage/machine room wing, and the central wing of the plant are described, as well as operation of the thermal installation. Results of acceptance tests with the 10 ton/hr radiation steam generator with two heavy oil burners and a three-zone feed grate indicate the maximum vol% of carbon dioxide in the flue gas to be 13.3, carbon monoxide 0.005, and oxygen 3.5. The Bacharach soot number was a maximum of seven with a normal average of four to five.

17131 APTIC NO. 35673

Seltzer, William, Stanley G. Moum, and Tevis M. Goldhaft

A METHOD FOR THE TREATMENT OF ANIMAL WASTES TO CONTROL AMMONIA AND OTHER ODORS. *Poultry Sci., 48(6):1912-1918, 1969. 10 refs.*

Flake paraformaldehyde as it disintegrates has the unique ability to neutralize ammonia gas produced by animal wastes. Because falke paraformaldehyde liberates formaldehyde gas slowly, it has an antimicrobial action that destroys a variety of organisms capable of producing noxious gases, thus minimizing odors that accompany decaying animal wastes for a prolonged period. The retention of nitrogen in flake paraformaldehyde-treated manure under a variety of field conditions was repeatedly confirmed by tests. Animals produce manure at a rate of approximately one pound of wet manure for each pound of feed consumed; flake paraformaldehyde should be placed in anticipation of manure production on the area where the manure would be deposited. The level used should be half of 1% of the total anticipated manure production for a 3 to 4-week period. (Author summary modified)

17132 APTIC NO. 35852

Shair, F. H. and J. H. Rupe

NITRIC OXIDE EMISSION STUDIES OF INTERNAL COMBUSTION ENGINES. *JPL (Jet Propul. Lab.) Quart. Tech. Rev., 1(2):23-35, July 1971. 5 refs.*

The effect of fuel composition on the emission characteristics of an internal combustion engine was investigated with initial emphasis on a comparison of nitrogen oxide emissions within the exhaust for various mixtures of natural gas and gasoline. A pneumatically driven atomizer permitted engine operation with gasoline fuel-air ratios down to 0.05; below 0.05, the engines misfired with 0both natural gas and gasoline fuels. In a natural gas-gasoline fuel mixture, NO concentration decreased almost linearly with increasing concentration of natural gas, based on a fuel-air ratio near 0.063. The substitution of natural gas as the fuel yielded fractional reductions in peak nitrogen oxide for a given amount of work but compromised available horsepower by about 28% and imposed the prerequisite of a rich mixture. (Author abstract modified)

17133 APTIC NO. 35539

Shimotake, H., M. L. Kyle, V. A. Maroni, and E. J. Cairns

LITHIUM/SULFUR CELLS AND THEIR POTENTIAL FOR VEHICLE PROPULSION. *Electric Vehicle Council, New York, Proc. Intern. Electrical Vehicle Symp., 1st, Phoenix, Ariz., 1969, p. 393-415. 23 refs. (Nov. 5-7.)*

Lithium/sulfur experimental cells of various designs were investigated to determine their potential for electric vehicle propulsion. Cells with liquid electrolytes and optimized current collectors can deliver short-term peak power densities in excess of five W/sq cm at one V. Capacity densities in excess of 0.3 A-hr/sq cm can be achieved at current densities of 1.4 A/sq cm, decreasing at higher current densities. Preliminary results with paste electrolyte cells show lower power densities and capacity densities. Further work is required on cathode current collectors and cells of configurations suitable for vehicle propulsion. It is necessary to emphasize the use of low-density materils of construction. Present laboratory cell performance is adequate for urban electric vehicles, but should be increased if high-performance electric vehicles are comtemplated. (Author conclusions modified)

17134 APTIC NO. 35614

Shinoda, Kazuo, Hiroshi Koide, and Akira Yii

ANALYSIS AND EXPERIMENTS ON CARBURETOR METERING AT THE TRANSITION REGION TO THE MAIN SYSTEM. *Preprint, Society of Automotive Engineers, Inc., New York, 15p., 1971. 5 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710206.)*

The problem of poor air-fuel ratio characteristics at the transition region from the idle to the main system was analyzed. Theoretical investigation determined that a uniform air-fuel ratio could never be supplied at the transition region without a main air-bleed system. Study of the effects of the main air-bleed system on fuel flow indicated that bleed air makes the specific weight of the fuel lighter, thus increasing fuel flow rate through the main system. Bleed air increases the specific volume of the fuel, decreasing fuel flow rate because the energy loss is increased by two-phase flow at the main discharge nozzle. Consequently, fuel flow rate is determined by the main air-bleed system through a balance of these two effects. Suction at the tip of the main discharge nozzle is affected by discharged fuel. (Author conclusions modified) 0

17135 APTIC NO. 35655

Siele, W. I. and C. Ribaudo

A LABORATORY STUDY OF AN EXTRACTION SYNTHESIS TECHNIQUE FOR THE ELIMINATION OF POLLUTANTS FROM THE MAHON FOG FILTER WATERS AT TNT PLANTS. *Picatinny Arsenal, Dover, N. J., Explosives Lab. TR-4163, 24p., May 1971. 3 refs.*

NTIS, DDC: AD 724114

The Mahon fog filter system is an air pollution control system in the trinitrotoluene (TMT) process line. By a simple extraction technique, using a volume ratio of approximately 1 toluene to 150 Mahon fog filter waste water, essentially all of the nitrotoluene impurities can be removed from the Mahon water presently polluting streams in the vicinity of TNT manufacturing plants. Military grade TNT can be prepared by nitration from these toluene extracts which contain up to 6.4% nitrotoluenes. This process, however, cannot be used to eliminate the nitrotoluenes present in TNT red waters. (Author abstract modified)

17136 APTIC NO. 35555

Smika, D. E.

DUST IN THE AIR FROM SOIL. *Nebraska Univ., Lincoln, Extension Service, Dept. of Agriculture, Washington, D. C., and Nebraska Univ., Lincoln, Coll. of Home*

Economics, Proc. Explor. Nebr. Pollut. Probl., Lincoln, Nebr., 1971, p. D-1 - D-7. 14 refs. (April 22.)

Dust in the air of the Central Great Plains is examined with respect to historical perspective, measurement methods, problems, the influence of climatic factors of wind and rain, effects of land management, soil control to prevent airborne particulates, and dust hazards. Measurement devices included collectors for particles settling out of the air due to gravity, affected by wind current and actual velocity, and collectors for suspended particulates, including filtration, impingers, electrostatic and thermal precipitators, and centrifuges.

17137 APTIC NO. 35434

Smith, Richard D.

THE CPU-400 GAS TURBINE INCINERATOR DEVELOPMENT. *Preprint, American Medical Association, Chicago, Ill., 12p., 1971. (Presented at the American Medical Association, Congress on Environmental Health, 8th, New York, April 26-27, 1971.)*

A unique basic unit for processing solid wastes and controlling pollution is currently under development. The solid wastes are used as fuel burned in a high-pressure combustor to produce hot gases that are used to power a gas turbine. In turn, the turbine drives a 15,000-kilowatt electric generator. Income from sale of this electric power may be used to offset the cost of operation of the plant. Subscale tests of the critical components of this system have been successfully completed and are reported. The system includes a fluidized bed, an inertial separator, an electrostatic precipitator, and a filter. (Author abstract modified)

17138 APTIC NO. 35864

Starr, Chauncey

ENERGY AND POWER. *Sci. Am., 225(3):37-49. Sept. 1971. 4 refs.*

By 2001 the annual U. S. demand for energy in all forms is expected to double, and the annual worldwide demand will probably triple. When one considers how difficult is is at present to extract coal without jeopardizing lives or scarring the surface of the earth, to ship oil without spillage, to find acceptable sites for power plants and to control the effluents of our present fuel-burning machines, the energy projections for 2001 indicated the need for thorough assessment of the available options and careful planning of our future course. Technical and economic feasibility is discussed for solar power, fusion, biological photosynthesis, fuel cell, and magnetohydrodynamics. Alternative fuels include alcohol, liquid hydrogen, and ammonia. Uses and environmental effects are considered.

17139 APTIC NO. 35276

Stueckrad, Joachim and Ulrich Dorstewitz

SOLID WASTE, WATER, AIR: WHAT ARE WE GOING TO BE CONFRONTED WITH? (Abfall, Wasser, Luft: Was kommt auf uns zu?). Text in German. Umwelt (Duesseldorf), no. 5:35-42, Oct./Nov. 1971. 6 refs.

Compromises between the desirability of continuous economic growth and the need for adequate environmental protection are discussed. On the basis of statistical analysis and market research, developments for West Germany are forecasted into the years 1980 to 2000, concerning the extent of pollution and means of combatting it, in the areas of solid waste, water, and air. In 1970, a total of 60 million tons or 200 million cu m of solid waste accumulated, composed of residues from mining and metallurgical industries, sludge from water filtration and industrial processes, and domestic refuse. For 1985, a total amount of 103 million tons or 310 million cu m is prognosticated. In 1970, 64% of the domestic refuse was disposed of by uncontrolled dumping with its inherent unhygienic features, 10% by controlled dumping, three percent by conversion to compost, and 23% by incineration. In 1985, disposal is anticipated to be 56% by controlled dumping, four percent by conversion to compost, 40% by incineration. The overall consumption of water for all purposes in 1970 was 16 billion cu m. Available water supplies are estimated at 46 billion cu m, of which one third is ground water and two thirds surface water. By the year 2000, the water demand could reach 30 billion cu m, and recirculation via purification and filtration stations will become vitally important for all industries and usages. Total emission of pollutants into the air in 1970 amounted to 20 million tons, eight million tons of which was carbon monoxide. The prognosis for 1970 indicates 22 million tons of pollutants, including eight million tons of CO, which represents a moderate overall rise only. However, while a considerable expansion of industry and a big increase in number of automotive vehicles is anticipated, the extent and effectiveness of antipollution measures and techniques will also have become substantially greater by that time.

17140 APTIC NO. 35845

Summers, Claude M.

THE CONVERSION OF ENERGY. *Sci. Am., 224(3):149-160, Sept. 1971.*

The great virtue in power schemes based on using the wind or solar energy collected at the earth s surface is that they would add no heat load to the earth s biosphere; they can be called invariant energy sources. To appreciate the long-term importance of developing invariant energy systems one must appreciate what exponential growth of any quantity implies. For example, during the next doubling period as much fossil fuel will be extracted from the earth as the total amount that has been extracted to date. In estimating how many doubling periods the nation can tolerate if the demand for electricity continues to double every 10 years, the crucial factor is probably not the supply of fuels -- which is essentially limitless because of nuclear reactors but the thermal impact on the environment of converting fuel to electricity and electricity ultimately to heat. Fuel-conversion efficiency is calculated for home furnaces, steam turbines, automobile engines, and light bulbs. Solar energy is also discussed.

17141 APTIC NO. 35580

Tabaczynski, Rodney J., John B. Heywood, and James C. Keck

TIME-RESOLVED MEASUREMENTS OF HYDROCARBON MASS FLOW RATE IN THE EXHAUST OF A SPARK-IGNITION ENGINE. *Massachusetts Inst. of Tech., Cambridge, Fluid Mechanics Lab., Pub-7110, 48p., April 1971. 8 refs.*

NTIS: PB 200172

Exhaust gas temperature, mass flow rate, and hydrocarbon concentration were measured in the exhaust of a single-cylinder research engine. Hydrocarbon mass flow rate was calculated as a function of crank angle. Based on calculation, approximately 40% of the hydrocarbons leave the cylinder early in the exhaust process due to the exit of the head quench layer; 50% leave the clyinder near the end of the exhaust process due to the exit of hydrocarbon rich vortex produced by the upward motion of the piston. A reduction of the quench volume created by the clearance between the piston and the first compression ring reduced average hydrocarbon concentrations. Air injection into the exhaust manifold reduced total hydrocarbon emission, but only the hydrocarbons that leave the cylinder early in the exhaust process were oxidized. (Author abstract modified)

17142 APTIC NO. 35957

Tada, Osamu

METAL FINISHING INDUSTRY AND ENVIRONMENTAL HEALTH. *(Hyomen shori kogyo to kankyo eisei). Text in Japanese. Hyomen Shori Janaru (Metal Finish. J.), 4(4):62-66, April 1971.*

The effects of various metal finishing processes such as welding, coating, and plating on the working environment and the maximum permissible concentration of pollutants are reviewed. In metal plating pretreatment, inhaling of vapors of trichloroethylene or perchloroethylene can damage nervous system and liver. Various acid baths give off mists, nitric oxide, and nitrogen dioxide, which can cause respiratory disorders, bronchitis, and pneumonia. Electrolysis mist can cause inflammation of membranes in the nose and throat. Inhalation of zinc fume can cause headache, exhaustion, debility, high fever, but the effects are not long-lasting. Ammonium chloride inhalation causes discomfort, but poisoning cases have not been reported. Ammonia can irritate eyes and respiratory systems. Lead can cause chronic disorders to blood cells, digestive systems, or nervous systems. Common effects of organic solvent used for paints, coating, and sealing materials are paralysis of the body, irritation of skin and membranes, and disorders of liver, kidney, nerve, and blood. During paint spraying, skin damage can occur, particularly with epoxy-based plastic. During the drying of paints, thermal decomposition of melamine creates formaldehydes, which irritate eyes, irritate the respiratory system, and cause general discomfort. Maximum permissible concentration is five ppm, but even one to two ppm creates a considerable irritation of eyes and noses. A harmful amount of ozone can be created in welding by inert gas arc, especially when welding nonferric metals. A concentration of one to two ppm causes headache, dizziness, nausea, and higher concentrations cause bronchial and lung inflammations.

17143 APTIC NO. 36006

Tanaka, Katsuhiko, Katsuhisa Fukaya, Kiyoshi Yoshitani, Syozo Fukui, and Saburo Kanno

HYGIENIC CHEMICAL STUDIES ON PUBLIC HAZARDS BY HARMFUL SUBSTANCES. IV. ATOMIC ABSORPTION PHOTOMETRIC DETERMINATION OF LEAD IN GASOLINE. *(Yugaibutsu ni yoru kogai no eisei kagakuteki kenkyu (daiyonpo). Genshi kyuko kodoho ni yoru gasorin-chu no namari no teiryoho). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 17(6):393-397, Dec. 1971. 2 refs.*

Atomic absorption spectrophotometry of different kinds of organic lead gave different values of lead even in the equivalent concentration of lead when using a premix burner. However, a total consumption burner gave equal absorptions for equivalent concentration solutions of lead diethyldithiocarbamate, tetraethyl lead, and tetramethyl lead. A simplified method for the determination of the lead content of gasoline was established based on this fact. The sample of gasoline is diluted with methyl isobutyl ketone and absorbance is measured at 2170 A, using the total consumption burner. The standard solution is prepared from the standard aqueous lead nitrate solution by the addition of sodium diethyldithiocarbamate solution and by extracting it with methyl isobutyl ketone. This method is convenient and safe, because dangerous tetraalkyl lead is not used as the standard substance. The lead content of 24 kinds of commercial gasoline was analyzed by this method.

17144 APTIC NO. 35692

Thies, Austin C.

ELECTRIC POWER AND THE ENVIRONMENT. *N. C. Eng., vol. 27:19-29, April 1971.*

The growth of the electric industry with minimum impact on the environment was discussed. High sulfur coal is being replaced by residual oil and consumption of natural gas is increasing. Nuclear is the most abundant and cleanest fuel of the future. Standards are being set for emission of nitrogen oxides in stack gases. Newer boilers are being designed to operate with low excess air to minimize nitrogen oxide emissions. More research is needed and is being done on the environmental impact of cooling tower plumes and blowdown, entrapment of fish in intakes, entrainment of organisms in cooling water, and beneficial uses of waste heat.

17145 APTIC NO. 35228

Thompson, D., T. D. Brown, and J. M. Beer

THE FORMATION OF OXIDES OF NITROGEN IN A COMBUSTION SYSTEM. *Preprint, American Inst. of Chemical Engineers, New York, 16p., 1971. 8 refs. (Presented at the American Institute of Chemical Engineers National Meeting, 70th, Atlantic City, N. J., Aug. 29 - Sept. 1, 1971, Paper 37e.)*

Nitrogen oxide formation in a combustion system, e.g., furnace, was investigated. Nitric oxide formation in a tubular combustor was substantially unchanged by the introduction of combustion driven oscillations within the frequency range 500-1250 Hz and pressure amplitudes of up to one psi. Local NO formation rates in a system operating within this range may be predicted by application of a kinetic model to time mean local temperatures and concentrations. Nitric oxide formation in post flame gases of hydrocarbon flames may be predicted by the application of the Zeldovich chain mechanism if the local oxygen atom concentration is correctly assessed. A modified chain rate equation was determined for the prediction of NO formation in the post flame gases of fuel lean hydrocarbon flames above 1800 K. (Author conclusions modified)

17146 APTIC NO. 35574

Vandegrift, A. E. and L. J. Shannon

PARTICULATE POLLUTANT SYSTEM STUDY. VOLUME II - HANDBOOK OF EMISSION PROPERTIES. *Midwest Research Inst., Envrionmental Sciences Section, Air Pollution Control Office Contract CPA-22-69-104, MRI Proj. 3326-C, 607p., May 1, 1971. 288 refs.*

NTIS: PB 203522

Particulate air pollution with respect to defined stationary emission sources, chemical and physical characteristics of the particulates and the carrier gas, and current control practices was investigated. Determining factors in the study of effluent characteristic included particle size distribution, toxicity, corrosivity, soiling potential, and optical properties; particle and carrier gas properties included particle distribution and shape, density, electrical resistivity, volumetric flow rate, gas temperature, and humidity. Cyclones, wet scrubbers, electrostatic precipitators, fabric filters, and afterburners were investigated for efficiency, application, cost, and advantages. The major sources of particulate emissions examined were stationary combustion processes (coal fuel oil, and gas), including electric power generation, industrial power plants, and domestic heating; crushed stone, sand, and gravel industries; agricultural operations, e.g., field burning, grain elevators, alfalfa mills, and cotton gins; iron and steel industry; cement manufacture; forest product industry; lime manufacture; primary nonferrous metallurgy; clay products; fertilizer manufacture; asphalt plants, ferroalloy manufacture; iron foundries; secondary nonferrous metals industry; coal preparation plants; carbon black; petroleum refining; acid manufacture; and incineration. Cost relationships were derived for the control methods and corresponding sources. derived for the control methods and corresponding sources.

17147 APTIC NO. 35050

Wagner, T. O.

MOTOR GASOLINE AND AUTOMOTIVE AIR POLLUTION. *SAE (Soc. Automot. Engrs.) Spec. Pub., no. 365:55-62, June 1971. 6 refs.*

Until 1970, the emission standards and the car modifications needed to comply with them had relatively little effect on gasoline quality, either in California or the remainder of the country. The only regulation on gasoline relevant to vehicle pollution was a limit of about 15% placed on total olefin content by California, and this limit required relatively small changes in refinery operations for compliance. Then, in 1970, Ford and General Motors announced that nearly all of their 1970 and later model cars would be designed to operate on unleaded gasoline of 91 Research octane number. The production capabilities of the petroleum industry, the effect of leaded gasoline on emissions, consumer advantages and disadvantages of unleaded gasoline, gasoline volatility, and future gasoline quality are discussed.

17148 APTIC NO. 35475

Wallace, F. J. and P. R. Cave

EXPERIMENTAL AND ANALYTICAL SCAVENGING STUDIES ON A TWO-CYCLE OPPOSED PISTON DIESEL ENGINE. *Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1971. 16 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710175.)*

Scavenging in the opposed piston engine operating at elevated pressure was examined experimentally and an attempt was made to relate the measurements of various theoretical models available. A Rootes TS-3, 3-cyl opposed piston engine was supplied with air from an external compressor and was fitted with an adjustable restriction in the exhaust allowing completely free choice of boost and delivery ratio. Concentrations of carbon monoxide, the tracer gas, were measured with an infrared absorption meter. The good agreement of airflow indicates that List s curves of scavenging efficiency are reliable, and may be used with confidence in step-by-step calculation. A postulated two-zone model represents adequately the two trends established, those of engine speed and delivery ratio, and could be used to model any engine cylinder where ordered swirl is the predominate air motion. The CO tracer gas technique is not wholly suitable for work with a compression ignition engine due to the marked influence of air/fuel ratio in the engine cylinder on completeness of CO combustion. In this respect, monomethylamine may be superior; on the other hand, the superior stability of CO at high temperatures ensues stability of composition of CO in the exhaust. The analysis of three samples of CO2 appeares to be the most attractive experimental method for the investigation of charging efficiency at elevated pressures in the two-cycle engine.

17149 APTIC NO. 35581

Weiner, Jack and Lillian Roth

AIR POLLUTION IN THE PULP AND PAPER INDUSTRY. *Inst. Paper Chem. Bibliog. Ser., no. 237, 67p., 1970. 208 refs.*

A bibliography of 208 references and abstracts on air pollution in the pulp and paper industry is presented. Control methods, measurement and analysis techniques, air quality criteria, deodorization, basic chemical reactions, operating procedures, exonomic factors, emission toxicity, meteorological factors, effects on human health and vegetation, defined sources within the industry, control legislation, and technological improvements are examined.

17150 APTIC NO. 35214

Williams, Glenn C., Adel F. Sarofim, and David H. Fine

NITRIC OXIDE FORMATION IN PREMIXED AND DIFFUSION FLAMES. *Preprint, American Inst. of Chemical Engineers, New York, 19p., 1971. 8 refs. (Presented at the American Institute of Chemical Engineers National Meeting, 70th, Atlantic City, N. J., Aug. 29 - Sept. 1, 1971, Paper 37c.)*

Premixed and diffusion flames were used to examine the dependence on excess air of nitrogen fixation in flames. Experimental and computational results for the flame types illustrated the basic difference in the NO formation rates. The factors that had a dominant influence on NO formation affected the adiabatic flame temperature at stoichiometric conditions; the rate of cooling of the combustion products as they flowed away from the flame front; the oxygen concentration in the NO formation zone on the air side of the flame front; the area of the flame envelope. Increased excess air had a relatively minor effect on flame temperature, but it increased the oxygen concentration in the zone primarily responsible for NO formation.

17151 APTIC NO. 35586

Wright, Edward S.

THE POTENTIAL OF THE GAS-TURBINE VEHICLE IN ALLEVIATING AIR POLLUTION. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1970. 18 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, New York, Nov. 29-Dec. 3, 1970, Paper 70-WA/GT-8.)*

Properly designed gas turbine engines for vehicular applications offer significant potential for alleviating air pollution caused by reciprocating engines. Total untreated emissions (hydrocarbons, carbon monoxide, and nitrogen oxides) of the gas turbine are likely to be only 50% of those of the treated Otto cycle engine which meets proposed 1980 standards and less than 3% of the output of an untreated Otto cycle engine. If all internal combustion engines were replaced by gas turbines, the motor vehicle contribution to pollution would probably be reduced from 60 to 2%. Thus, if their performance, efficiency, and manufacturing costs are competitive with internal combustion engines, gas turbines could eliminate automotive air pollution as a cause for environmental concern. Data on automotive gas turbine emissions, engine power output, vehicle performance, fuel consumption, and manufacturing costs are included.

17152 APTIC NO. 35220

Zegel, W. C., A. F. Souza, and L. R. Reckner

EXHAUST EMISSIONS OF LIGHT AIRCRAFT. *Preprint, Society of Automotive Engineers, Inc., New York, 10p., 1971. 6 refs. (Presented at the National Business Aircraft Meeting, Wichita, Kan., March 24-26, 1971, Paper 710370.)*

Exhaust emissions from nine light aircraft were determined with a nine-mode takeoff-cruise-landing (TCL) cycle. Exhaust component concentrations and fuel consumption rates were measured for each mode during 10 test flights per aircraft. Pollutant concentrations were converted to emission rates per pound of fuel, per minute, per mode, per TCL cycle, and per tanding-takeoff (LTO) cycle. The light piston-engine aircraft tested emitted carbon monoxide at levels higher than those of uncontrolled automobiles and substantially higher than standards set for 1972 vehicles in terms of pounds of pollutant per pound of fuel. Aircraft hydrocarbon emissions were in the range emitted by current controlled automobiles; nitrogen oxide emissions were low except during lead mixture operation. Fuel-injected engines produced much higher hydrocarbon concentrations than normally aspirated engines. The effect of other aircraft parameters (such as use time, engine size, and airframe design) on exhaust composition was small. No natural afterburning of CO or hydrocarbons occurred in aircraft exhaust during any operating cycle. Exhaust reactors can be applied in principle to aircraft emissions. However, a number of constraints unique to aircraft will make it necessary to carry out additional design changes to adopt automotive techniques for aircraft use. In the meantime, proper engine maintenance and setting of the air/fuel mixture to the minimum richness required for safe operation would be beneficial in minimizing aircraft exhaust emissions.

17153 APTIC NO. 35619

Zubovic, Peter

MINOR ELEMENT DISTRIBUTION IN COAL SAMPLES OF THE INTERIOR COAL PROVINCE. *Advan. Chem. Ser., no. 55:232-247, 1966. 12 refs.*

Distribution patterns of 13 minor elements in 54 coal samples indicate that beryllium, boron, germanium, and gallium the metals forming small, highly charged ions (high ionic potential) are concentrated near the source areas of a coal basin. The other elements show various distribution patterns which suggest differences in their transport characteristics. Yttrium and lanthanum concentrations demonstrate a fractionation whereby the Y/La ratio is highest in those coals nearest the source areas of the elements. Vanadium and to a lesser extent, chromium are preferentially enriched in Kentucky bed 9 and its correlative Illinois bed 5 . The high concentration of minor elements in weathered samples, relative to unweathered samples, suggests that weathering processes may significantly increase the minor element content in coal. (Author abstract)

CONTROL METHODS

17154 APTIC NO. 35060

PRESENT STATE AND FUTURE TREND OF RESIDUAL OIL DESULFURIZATION. *(Juyu datsuryu no genjo to kongo no hoko). Text in Japanese. Kankyo Sozo (Environ. Creation), 1(4):43-48, Nov. 1971*

By the end of 1970, 11 indirect desulfurization systems with a total capacity of 256,000 bbl/d were operating, and they are expected to increase to 15 systems, producing 39,500 bbl/d. Japanese oil import consists of 41% Iranian oil containing 2.5 to 2.6% sulfur in the heavy oil form, which can be reduced to 1.5 to 1.6% by an indirect desulfurization process. This compares with the Khafji oil, eight percent of the oil import, which contains 4.1% sulfur in heavy oil which can be reduced to 2.6% content. Three direct desulfurization systems presently operate in Japan, treating 112,760 bbl/d oil, and two more systems will be added in the next two years, increasing the capacity to 156,000 bbl/d. Of the stabilized bed operation and fluidized catalyst bed processing, the latter is more complex in mechanism, but the exchange of catalyst is possible without stopping the operation of the entire system. Also, maintenance of catalytic activity is easier, making a continuous operation for an extended time possible. It also desulfurizes residual oil with many metallic components which decreases the activity of catalysts and of decompressed distillation residual oil. Since this process is regarded most suitable for Japan which has to depend on various types of raw oil, The Ministry of International Trade and Industry has spent approximately $3,600,000 since 1967 on research and development of fluidized bed direct desulfurization technology. The goal is development of a desulfurization technique with a 70% result at the cost of approximately $3/k l. By the end of 1971, designing of actual plant and collection of basic data necessary for the construction and operation are to be completed.

17155 APTIC NO. 35112

LEAD-FREE GASOLINE REPERCUSSIONS IN THE PETROCHEMICAL INDUSTRY. *(Essence sans plomb: ses repercussions sur la petrochimie). Text in French. Chim. Actualites, no. 1449:14-15, Sept. 30, 1971.*

The elimination of lead from gasoline will increase the demand for aromatic hydrocarbon fractions because they will principally be used to increase octane rating. Lead-free gasoline will thus contain 20-25% more aromatic hydrocarbons than leaded gasoline. In the U. S., this resulted in an increase in the cost of these fractions by about $15 per ton due to the rigidity of refining processes in America. The abandonment of lead in gasoline will have its biggest effect on olefins which, in the form of butylene and propylene, will also be used to increase octane rating. Producers of tetramethyl and tetraethyl lead, whose production in Europe amounts to $150 million would lose their market, should this additive be banned.

17156 APTIC NO. 35163

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO EXHAUST GAS PURIFICATION. *(Bergwerksverband G.m.b.H., Essen (W. Germany)) Brit. Pat. 1,145,172. 5p., March 12, 1969. (Appl. Sept. 22, 1966, 13 claims).*

A method for removing impurities, particularly sulfur dioxide, from exhaust gases is described in which the gas flows into an adsorber containing a moving layer of granular adsorption material. When the adsorption material is contaminated with gas impurities, it is passed into an immersion tank which contains a desorption liquid, preferably water. The purified adsorption material is separated from the desorption liquid and returned to the adsorber. With dust-laden exhaust gases, the dust may become dissolved in the liquid. It can be removed from the adsorption fluid before immersion by filtering or blowing.

17157 APTIC NO. 35177

Los Angeles County Air Pollution Control District Calif.

PROFILE OF AIR POLLUTION CONTROL IN LOS ANGELES COUNTY. *67p., Jan. 1969.*

A factual profile of air pollution sources, the effectiveness of the control programs, and projections for the future in Los Angeles County are presented with general statistics on fuel consumption, use of solvents, and emissions are included. Data on emissions of organic gases, particulates, nitrogen oxides, sulfur dioxide, and carbon monoxide from the major individual sources (motor vehicles, organic solvent usage, petroleum, aircraft, combustion of fuels, and chemical processes) are examined. Specific types of equipment are investigated for industrial emission sources. Control methods, including permits issued by the government, use of low-sulfur content fuel, changeover to natural gas, and control equipment, are discussed. The causes, effects, and cures of photochemical smog are investigated. Seasonal and annual data on contaminant concentration levels correlated with eye irritation; concentrations of ozone, oxidants, nitrogen dioxide, CO, and particulates; and values for alert stages for toxic air contaminants are tabulated.

17158 APTIC NO. 35197

Massachusetts Inst. of Tech., Cambridge, Clean Air Car Race Committee

CLEAN AIR CAR RACE - 1970. (SUMMARY REPORT). *Air Pollution Control Office Contract CPA-70-169, Rept. APTD-0680, 293p., Feb. 1971. 3 refs.*

NTIS: PB 199479

The 1970 Clean Air Car Race witnessed 43 student teams from 32 different educational institutions successfully complete construction on various types of vehicle power plants which were subsequently tested for exhaust emissions, general performance, fuel consumption, and reliability. The technology whereby exhaust emissions can be reduced, the cost involved, and the task of educating the consumer to accept his share of the responsibility were dealt with by the CACR student-faculty teams. The achievements and impacts for which the CACR was responsible are assessed. Internal combustion engines, Rankine cycle engines, Brayton cycle engines, electric-powered vehicles, and hybrid-electric powered vehicles were entered in the race. Technical reports and test data are presented for each vehicle, as well as the selection procedure for determination of class and overall winners.

17159 APTIC NO. 35294

RESIDUAL SULPHUR REMOVAL FROM GAS STREAMS. LURGI, I.F.P. AND PARSONS ALL OFFER NEW PROCESSES. *Sulphur, no. 91:40-43, Nov./Dec. 1970.*

The Sulphreen process, developed by Lurgi of West Germany in conjunction with the French organization, Societe Nationale des Petroles d Aquitaine, is primarily designed for the treatment of waste gases from Claus units. Claus plant off-gases contain about one percent hydrogen sulfide, 0.5% sulfur dioxide, and up to one percent sulfur in aerosol form. The Sulphreen system allows the catalytic conversion of these residual quantities into recoverable elemental sulfur. Activated carbon acts as both catalyst and adsorption/regeneration medium. The Institut Francais du Petrole has announced a process which incorporates the Claus reaction for formation of sulfur; this reaction takes place in the presence of a solvent, using a catalyst, the nature of which is being kept confidential. The Beavon process, developed by Ralph M. Parsons Co., commences with the conversion of all sulfur values in the Claus off-gas into hydrogen sulfide. This is achieved using a cobalt molybdenum catalyst. Subsequently, cooling is used to condense water vapor from the hydrogen sulfide stream, and sulfur is produced directly from the hydrogen sulfide by use of the Stretford process.

17160 APTIC NO. 35344

FUME CONTROL PLANTS. *Brit. Steelmaker, 37(8):25-27, Aug. 1971.*

Fume control installations on electric arc furnaces in Great Britain are described. In general, the systems include direct extraction with sliding sleeves, semidirect with close-fitting hoods, or indirect with remote mounted hoods. Types of gas cleaning equipment used are venturi scrubbers, flooded disc scrubbers, electrostatic precipitators, and fabric filters. Key features of each system are noted.

17161 APTIC NO. 35354

(Inventor not given.)

PROCESS FOR THE REMOVAL OF SULPHUR OXIDES FROM GAS MIXTURES. *(Shell International Res. Co., The Hague) Brit. Pat. 1,154,009. 6p., June 4, 1969. (Appl. Aug. 10, 1967, 20 claims).*

In the process described, a hot waste gas, such as flue gas, is contacted with a solid acceptor consisting of a carrier material, a vanadium compound, and an alkali metal compound, at a temperature of 300 to 450 C. By using these temperatures the purified gases can pass through the stack without being heated. The carrier material may be alumina, silica, silica-alumina, or silica-magnesia; the alkali metal compound may be potassium or sodium oxide. Vanadium pentoxide is the preferred vanadium compound. When loaded with sulfur oxides, the acceptor may be regenerated by treatment with a reducing gas at temperatures slightly higher than those at which the acceptor was loaded. The loaded acceptor may be continuously removed from the reactor and passed to a second reactor where it is contacted with a reducing gas. It is then recycled back to the first reactor.

17162 APTIC NO. 35355

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO APPARATUS FOR ELECTROSTATIC PRECIPITATION OF PARTICLES FROM GASEOUS STREAMS. *(Koppers Co., Inc., Pittsburgh, Pa.) Brit. Pat. 1,151,026. 6p., May 7, 1969. (Appl. Aug. 10, 1967, 8 claims).*

The device described consists of a discharge electrode and collector electrode system. As the stream passes the discharge electrode, the particles are electrostatically charged and migrate toward the collector electrode system. Thus, the dust concentration increases in the outer portion of the gas stream and decreases in the inner portion. The collector electrode system consists of at least two surfaces. When dusts accumulate on the first surface, it is removed from association with the discharge electrode and replaced with the second surface. In this way both surfaces can alternately be used in the system and cleaned. The surfaces of the collector electrode may be cleaned mechanically or with the scouring action of high-velocity gases.

17163 APTIC NO. 35373

MSA Research Corp., Evans City, Pa. and Singmaster and Breyer, New York, N. Y.

INORGANIC LIQUIDS FOR REMOVING SO2 FROM FLUE GASES. PHASE II. *National Air Pollution Control Administration Contract PH 22-68-11, Rept. APTD-0723 MSAR Job XA 720451, Rept. MSAR 71-122, 129p., July 1971. 116 refs.*

NTIS: PB 203061

Molten nitrate-calcium oxide and tin-lead alloy were investigated as inorganic liquids for removing sulfur dioxide from stack gases. The rate of absorption of the CaO-molten nitrate system was comparable to that of S02 or carbon monoxide into basic aqueous solutions. The rate controlling step in the absorption of S02 from simulated stack gases was diffusion in the liquid phase. The reaction products, calcium sulfate and calcium sulfite, can be concentrated by centrifugation and separated as insoluble fractions by water washing. Reductive regeneration by a carbon reductant can yield either S02 directly at high temperature, or, at lower temperatures, calcium sulfide which can be treated with steam and carbon dioxide to yield hydrogen sulfide as the sulfur containing product. The tin-lead alloy system was severely oxidized in the presence of the excess air in the flue gases. Oxidation was minimized by adding about 0.5% by weight of zinc to the Sn-Pb eutectic. The reaction proucts of S02 absorption by the Sn-Pb-Zn system were primarily sulfides and oxides of Sn and Zn. (Author summary modified) 0

17164 APTIC NO. 35429

GCA Corp., Bedford, Mass., Technology Div.

BIBLIOGRAPHY. VOLUME III FABRIC FILTER SYSTEMS STUDY. *National Air Pollution Control Administration Contract CPA-22-69-38, 173p., Dec. 1970. 500 refs.*

NTIS: PB 200650

Domestic and foreign literature on fabric filtration was surveyed and an annotated bibliography prepared that includes most of the recent and pertinent literature on fabric filter technology. The 50 documents constituting the bibliography are consecutively numbered in the order of their review and cross-indexed by author and descriptor. A list of descriptors and their definitions is provided. The main descriptor categories relate to type of article, dust source, dust type, effluent gases, fabric, performance of filter systems, removal of cake deposit, design of filter system, theory, and the fabric filter industry.

17165 APTIC NO. 35490

SULPHUR DIOXIDE SCRUBBER DEVELOPED BY BAHCO. EFFICIENT REMOVAL OF SO2 FROM STACK-GASES. *Sulphur, (91):47, Nov.-Dec. 1970.*

A two-stage scrubber using lime removes 98% of sulfur dioxide and soot from stack gases. In each stage, flue gases are contacted with hydrated lime solution, which is dispersed into fine droplets that become suspended in the turbulent gas stream. The droplets formed in the first stage absorb most of the solids in the flue gas and partially remove sulfur oxides. The remaining oxides are removed by the droplets formed in the second stage. Guide vanes in the upper part of each stage impart a rotational speed to the gas streams so that the droplets are collected for dispatch to a sedimentation vessel. Cost of the scrubber is about $80,000.

17166 APTIC NO. 35633

Ambassade de France, Washington, D. C., Mission Scientifique

AIR POLLUTION FROM AUTOMOBILES. SOLUTIONS PROPOSED FOR NEW YORK. *(La pollution de l air par les automobiles. Solutions proposees pour New York). Text in French. Ann. Mines (Paris), no. 10:27-32, Oct. 1970.*

Current New York City pollution levels from automobile exhaust emissions, including hydrocarbons, carbon monoxide, and nitrogen oxides, are reviewed and current legislation in force in New York concerning pollution is evaluated. The Yale Legislation Service recommends equipment of municipal vehicles and taxicabs with low-emission engines and maximum emission limits of 0.3 g/km hydrocarbons, 7 g/km CO, and 0.4 g/km NOx. Such vehicles would cost about 25% more than conventional vehicles but would create an experimental market and thus encourage more widespread use. The five propulsion systems proposed include the Rankin cycle engine, an electric engine, and internal combustion engines powered by liquefied gas, liquefied natural gas, compressed natural gas. The addition of tetraethyl lead to gasoline should be gradually reduced to a level of 0.12 g/l by Jan. 1, 1973. Catalytic converters reducing the emission of hydrocarbons and CO should be installed on all municipal vehicles. All vehicles should be equipped with less powerful engines than at present and should be inspected once a year. An automobile pollution tax is recommended, depending on the level of pollutants emitted by each car.

17167 APTIC NO. 35784

WET-PROCESS FLUE GAS DESULFURIZATION UNIT. *Chem. Economy Eng. Rev., 4(1):27-29, Jan. 1972.*

Chiyoda Chemical Engineering and Construction, Japan, has succeeded in developing a new type of flue gas desulfurization unit, which is called Chiyoda Thoroughbred 101. This process consists mainly of three stages -- absorption, oxidation, and crystallization (separation). Sulfur oxides are removed through absorption by dilute sulfuric acid in a packed tower or shelf tower. The sulfurous acid in the dilute acid formed in the absorption stage is completely oxidized with oxygen to become sulfuric acid. The air bubble column using air as the oxidizing agent is recommended for this purpose. The dilute acid is neutralized with a compound of calcium so that gypsum will be crystallized out continuously. Costs are cited.

17168 APTIC NO. 35813

SHELL FLUE GAS DESULPHURIZATION PROCESS. *Chem. Process (London), 17(11):13, 15, Nov. 1971.*

Estimated capital and operating costs are given for the Shell flue gas desulfurization process (SFGD). The estimates are based on pilot plant experience with two units processing approximately 3.5 million cu ft/hr and 19 million cu ft/hr, flue gas from fuel oil containing 2.85% sulfur. The SFGD process operates at 750 F and employs a solid, fixed bed of sulfur dioxide acceptor in a reactor designed so that particulate matter need not be removed from flue gases prior to their entry in the bed. This feature simplifies the process both mechanically and operationally. The acceptor is regenerated in place, and the evolved SO2 is ulitized as such or converted to sulfuric acid or elemental sulfur.

17169 APTIC NO. 35821

ROTARY ENGINE EXHAUST EMISSIONS. *SAE Australasia, 31(5):187, Sept.-Oct. 1971.*

Because its high surface/volume ratio permits combustion to be carried out at a comparatively low temperature, the rotary engine emits fewer nitrogen oxides than a reciprocating engine. Emissions of carbon monoxide are similar for the two engines and emissions of hydrocarbons a little higher for the rotary engine. A specific advantage of the rotary engine in exhaust emission control is that it can accomodate control devices, such as thermal reactors, air injectors, and thermal reactors, much more readily than present reciprocating engines. With their superior knocking resistance and no valves, rotary engines can also operate satisfactorily on lead-free gasoline.

17170 APTIC NO. 35824

Aronetics Inc., Tullahoma, Tenn.

SCRUBBING SYSTEM REMOVES SUBMICRON PARTICULATES. *Chem. Eng., vol. 78:96,98, Sept. 20, 1971.*

A unique wet scrubbing system is able to remove submicron-sized particles from gas streams both efficiently and inexpensively -- using waste heat discharged by the process, or heat from combustible components in the waste gas, as its principal power source. In its first full-scale installation, the ADTEC System is reportedly achieving a 99.6% removal efficiency for a furnace exhaust in which 85% of the dust particles are smaller than 0.1 micron, and is taking out substantial quantities of water-soluble gases as well. As dust-laden gas flows from a furnace, a standard heat-exchanger transfers heat from it to a high-pressure water stream. The water then enters an expansion nozzle, centered in a circular mixing duct in which the cooled gas flows. Here a nearly adiabatic flash occurs, and the remaining liquid is highly atomized into water droplets averaging 10 microns in diameter. This two-phase mixture of steam and water leaves the nozzle at 1000 ft/sec, compared to a velocity of about 100 ft/sec for the concurrently flowing gas stream. Dust particles are then readily entrained within the high energy, high surface area water droplets.

17171 APTIC NO. 35834

SHOWA DENKO PROCESS REMOVES MERCURY FROM GAS STREAMS. *Eur. Chem. News, 19(482):30, May 28, 1971.*

Showa Denko KK of Tokyo, Japan, has designed a process to remove mercury from the hydrogen stream generated in the electrolysis reaction of mercury cell-type chlorine units and not from the plant s waste water and liquid stream. Removal is by absorption of the mercury entrained in the gas stream in a packed tower containing a special absorbent solution. The mercury forms a precipitate, thus separating it from the gas which then passes through the system. The mercury can then be reclaimed in a pure and uncontaminated state from its precipitate. A pilot plant and mercury regeneration are described.

17172 APTIC NO. 35835

POLLUTION SOLUTION. *Tool. Prod., 37(10):51-52, Jan. 1972.*

About 19 years ago, when Ford Motor Company built its Cleveland Foundry in a non-residential area, the firm spent $1.3 million on exhaust control devices and $2.5 million dollars in the next 14 years on improved controls. Since 1967, Ford s antipollution program has cost about $9 million. The white plumes of steam, which come out of the stacks and dissipate, are designed to contain no more than 0.05 grain of solids per std cu ft. Gases coming from the cupola at 2000 F cool to 500 F when quenched in high-pressure water sprays in the bypass duct. Next, they descend through a gas-cleaning scrubber where droplets of water in a turbulent air stream pick up the dust. Centrifugal force in the particle-removal device then separates the air from the dust-loaded droplets, which drain via sluiceway to a settling basin. Cleaned air flows through the exhaust fan and up the stack.

17173 APTIC NO. 35871

WHY CLEAN AIR PROGRAMS? Fuel Oil Oil Heat, 31(1):27-31, 68-69, Jan. 1972.

More and more heating oil dealers are acknowledging their responsibility and obligation in the fight against air pollution. This is being done with the inauguration of clean air programs, which typically involve testing and adjusting boilers for top operating efficiency. There are variations, but in general the tests and adjustments aim at low smoke or no measureable smoke and better than average carbon dioxide readings. The program undertaken by the Fuel Merchants Association of New Jersey is described, as well as the programs organized by the Massachusetts Better Home Heat Council, the Pennsylvania Petroleum Association, the Wisconsin Oil Heat Council, the Oil Heat Institute of Greater Washington, the Virginia Oil Fuel Institute, and the heating oil dealers in Maryland.

17174 APTIC NO. 35933

A PRACTICAL SOLUTION TO POLLUTION CONTROL COSTS FOR PAINT FINISHING LINES. *Ind. Heating, 38(12):2421, 2422, 2428, Dec. 1971.*

A large metal working plant which recently installed a coil coating line decided to make a virtue of necessity by installing a fume processing system of advanced design and radical concept. For, as it incinerates process oven fumes, enough Btu's are recovered to supply the plant's entire metal preparation heat and its entire building makeup air heat needs. At the same time, process oven heat demands are reduced nearly 44%. The hydrocarbons in the exhaust fumes are used as fuel for the heat recovery system, the heart of which is a Caliqua heat exchanger in the exhaust gas stream of the incinerator.

17175 APTIC NO. 35950

HELICAL REINFORCEMENT. *(Schlankes, durch Biegesschwingungen gefaehrdetes Bauwerk, insbesondere Kamin). Text in German. (Donges Stahlbau G.m.b.H., Darmstadt (West Germany)) W. Ger. Pat. 1,759,086. 2p., Sept. 9, 1971. (Appl. March 28, 1968, 5 claims).*

A helical reinforcement for smokestacks with a vertical longitudinal axis is described which consists of sheet metal strips attached to the outer surface of the smokestack in two to six spirals for at least a certain length of the stack. The spirals are not continuous sheet metal helices but consist of parallel individual strips attached at a certain distance from each other. The radial width of individual sheet metal strips should not be smaller than one fiftieth, nor larger than one fourth, preferably one tenth, of the smoke stack diameter. The pitch of the helices should not be smaller than three times nor larger than twenty times, preferably ten times, the diameter of the smoke stack. The vertical axial distance between individual sheet metal strips forming the helices should equal five times the vertical width of the strips.

17176 APTIC NO. 36017

KEEP IT CLEAN. *Fuel Oil Oil Heat, 31(1):32-35, Jan. 1972.*

Ten maintenance steps for extending diesel engine life are outlined. The steps will result in increased equipment availability, decreased operating expenses, improved working conditions, and cleaner exhaust emissions.

17177 APTIC NO. 36018

TWENTY-FIVE THOUSAND NM3/H FLUE-GAS DESULFURIZATION PLANT. *Chem Economy Eng. Rev., 4(1):43, Jan. 1972.*

In July 1971, with the cooperation of Jujo Paper Co., Hitachi Ltd. built a 25,000 cu Nm/hr semi-wet flue gas desulfurization plant at the Jujo plant in Japan. The process involves reactions in which flue gas is brought into contact with an alkaline solution such as sodium hydroxide. Reaction products are dried by the sensible heat of the flue gas, and the by-product is recovered in the form of a solid powder consisting mainly of sodium sulfite.

17178 APTIC NO. 35778

Adams, W. E., H. J. Gibson, D. A. Hirschler, and J. S. Wintringham

MEETING FUTURE EMISSION STANDARDS WITH LEADED FUELS. *J. Automotive Eng., 2(10):12-16, Nov. 1971. 8 refs.*

Since exhaust emissions are now measured on a mass basis, the smaller mass of emissions with a higher compression ratio becomes a very important consideration. Furthermore, the higher compression ratio can permit operation at leaner air/fuel ratios and allow the use of higher rates of exhaust gas recycle. Both these advantages of high compression are used in the lean-reactor car program of the Ethyl Corporation. Hydrocarbons, carbon monoxide and nitrogen oxides can be minimized. A three-venturi carburetor was developed to produce a lean air/fuel ratio. Reaction in the exhuast system is improved by conserving heat in the exhaust ports by lining them with stainless steel tubes insulated from contact with the cooled walls of the exhaust ports. Further reaction is promoted by substituting larger than normal exhaust manifolds of thin stainless steel for the conventional cast iron manifolds. The very stringent standards for nitrogen oxides require exhaust gas recycling, while lead particulates can be agglomerated by cooling the exhaust gases. The gases are then passed through a cyclone to precipitate particulates. An experimental car was produced which is close to meeting 1975 emission standards. The lean-reactor car has eliminated 95% of the unburned hydrocarbons, 90% of the CO, and 80% of NOx.

17179 APTIC NO. 35496

Aizawa, Kiyoshi and Hirohide Iijima

FLUIDIZED BED INCINERATION SYSTEM. *(Ryudosho shiki shokyaku sochi ni tsuite). Text in Japanese. Nenryo Oyobi Nensyo (Fuel and Combustion), 38(11):43-50, Nov. 1971.*

In a fluidized bed combustion incinerator, a layer of heated and constantly moving particles such as sand acts as a combustion medium, and makes complete burning possible at the low temperature of 700 C. The solid waste comes in contact with the heated sand and organic material is completely decomposed and oxidized. The combustion gas goes through a heat exchanger before emission from the stack. Soot is further collected by either a multi-cyclone, a filter, or a wet-type dust collector. The smoke is made completely odorless by the complete combustion. Flow sheets and the design and operational specifications are presented.

17180 APTIC NO. 35478

Aizenberg, B. Sh., A. G. Belikov, D. L. Bukhanovskii, G. M. Gordon, V. P. Kovalev, G. A. Matrakhin, Ya. V. Mishurin, and V. N. Tsessarskii

OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING. *Soviet J. Non-Ferrous Metals (English translation from Russian of: Tsvetn. Metal.), 42(8):44-48, Aug. 1969. 1 ref.*

The operation of bag filters with air jet cleaning to control the dust content of waste gases was tested on lead smelting shop exhaust gases in a pilot plant study. Components of the system, operating procedures, and variable operational factors were examined. Test results and design criteria are included. The experimental filters produced dust outputs of 3.20-7.50 mg/n cu m, 2.0-3.6 mg/n cu m, and 4.3-7.3 mg/n cu m under different conditions.

17181 APTIC NO. 35996

Ando, Jumpei

ECONOMICS OF FLUE GAS DESULFURIZATION. *(Keizaisei kara mita haien datsuryu no shomondai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(12):1133-1139, Dec. 1971. 8 refs.*

The wet-lime method of desulfurization is discussed, various European methods are briefly mentioned, and the cost comparison of various methods practised in Japan are made from the standpoint of by-product recovery. Recovery products are sodium sulfite, sulfur dioxide concentrate, sulfuric acid, plaster, and ammonium sulfate. Three methods of ammonium sulfate recovery are compared. (1) SO2 is absorbed by ammonia water and oxidized; the ammonium sulfate is added to slurry made of phosphorus and nitric acid and plaster is produced. The filtered liquid is ammoniated and a nitrogen-phosphorous-ammonia compound is produced. (2) After ammonia absorbs SO2, the latter is driven out and recovered, and the liquid is made into ammonium sulfate. The recovered SO2 is used for sulfuric acid and part of it is recirculated for recovering SO2, the rest is used for decomposition of phosphorus by mixing it with nitric acid. The rest is the same as (1) and produces plaster and fertilizer of N-P-NH3 in the composition 26-19-0. (3) Ammonia sulfate is produced in the same way as (1), is heated, and is separated into ammonia and sulfate NH3HSO4; ammonia is used for the recovery of SO2 and NH4HSO4 is dissolved in water and used for decomposition of phosphorus. After plaster is separated from the slurry, the filtered liquid is ammoniated and concentrated, and sulfur-phosphorous-ammonia fertilizer of 19-14-0 composition is manufactured. The installation cost of (1) is the highest, but cost per production is much more economical. Nitric base chemical fertilizer is in much demand; the plaster produced by the first method is of good quality.

17182 APTIC NO. 35572

Andrews, D. Marshall

VAPOR PHASE IMPREGNATION OF ACTIVE CARBONS. *Commonwealth Scientific Corp., Alexandria, Va., Army Contract DAAA15-69-C-0302, Proj. 1B662706A095, Rept. QPR-2, 33p., Sept. 15, 1969. 4 refs.*

NTIS: AD 861483

The deposition of copper and chrome to produce an impregnated carbon with activity similar to that of a whetlerite was investigated. A treatment was devised which gave vapor-impregnated, copper-coated carbons hydrogen chloride activity equal to or better than wetlerites. Concentration of impregnants was determined from emission spectrographic analysis; x-ray diffraction patterns were run to determine the chemical structure of the impregnant. A method was developed for depositing chrome as the metal in the pores of the carbon. Vapor impregnation resulted in deposition of a more uniform film, combined with penetration into the small pores of the carbon. Based on nitrogen adsorption isotherms, twice as much material could be deposited from vapor phase as from solution impregnations. (Author summary modified)

17183 APTIC NO. 35686

Andrews, D. Marshall

VAPOR PHASE IMPREGNATION OF ACTIVE CARBONS. QUARTERLY PROGRESS REPORT NO. 3. (JULY THROUGH SEPTEMBER 1969). *Commonwealth Scientific Corp., Alexandria, Va., Army Contract DAAA15-69-C-0302, Proj. 1B662706A095, 22p., Sept. 1969. 4 refs.*

NTIS: AD 863675

A sample of 0.5% by weight platinum impregnated carbon was hydrogen treated in an attempt to further activate the platinum. This was accomplished by back filling the impregnation apparatus with hydrogen, while maintaining the impregnated carbon at 350 C. However, this sample failed to show significant activity. Another impregnation procedure was designed to take advantage of the low sublimation temperature of aluminum chloride by directly vaporizing AlCl3 into carbon under vacuum. Samples of copper chrome vapor impregnated carbon prepared during this period also failed to show catalytic activity. Possible reasons are cited, as well as the direction future work will take.

17184 APTIC NO. 35687

Andrews, D. Marshall and John P. Redmond

VAPOR PHASE IMPREGNATION OF ACTIVE CARBONS. QUARTERLY PROGRAM REPORT NO. 1 JANUARY THROUGH MARCH 1969. *Commonwealth Scientific Corp., Alexandria, Va., Army Contract DAAA15-69-C-0302, Proj. 1B662706A095, Rept. OPR-1, 25p., June 2, 1969. 5 refs.*

NTIS, DDC: AD 861455

Vapor impregnation methods for depositing catalysts in the pores of activated carbon were studied. A successful method for the vapor deposition of copper using copper acetylacetonate as the reactant was developed and samples containing eight percent, two percent, and one-half percent copper by weight were prepared using PCC grade CWS carbon. Results of nitrogen adsorption isotherms and PS breakthrough tests on eight percent by weight Cu impregnated indicated that this high loading produced considerable reduction in surface areas. The four percent by weight impregnate did not show this loss of surface area, and this concentration will be used for future impregnation. Also developed was a technique for the vapor impregnation of activated carbon with chromium trioxide through the ammonalysis or hydrolysis of chromyl chloride which had previously been adsorbed on the carbon. Samples were prepared by this method on carbon already impregnated with copper. Analytical tests showed that chromium was present on the carbon in the plus six oxidation state and copper in the plus two state. Emission spectrograph analysis indicated the metals were present in the predicted concentration range. (Author summary modified)

17185 APTIC NO. 35237

Andrianov, A. P.

A COMBINED METHOD FOR THE REMOVAL OF SULFUR OXIDES FROM FLUE GASES. *(Kombinirovannyy metod ochistki dymovykh gazov ot okislov sery). Text in Russian. Nov. Tekh. (Moscow), no. 58-59:14-16, 1936.*

A combined method for the removal of sulfur oxides from flue gases is described that is designed to produce fuming sulfuric acid and alabaster as byproducts. The flue gas is introduced into a concentrator and then into an absorber system consisting of three units, where SO2 is absorbed and oxidized to sulfuric acid. The sulfuric acid is then concentrated to 40%, filtered and introduced into the reaction plant. A 50% decontamination of the flue gas occurs during this first stage; the gas is then transferred to a lime-containing scrubber and then released into the atmosphere. The suspension for wetting the scrubber is passed into the catalysing unit, which contains pyrolusite and iron sulfate; here, calcium sulfates (CaSO4, CaSO3) produced within the scrubber are crystallized. The salt-bearing slurry is then transferred to the reactor plant and treated with the 40% H2S generated by the absorber system. The SO2 thus produced is transferred to a fuming sulfuric acid plant, while the gypsum slurry goes to an alabaster plant.

17186 APTIC NO. 35916

Aoki, Teruo

DUST COLLECTOR. *(Shujin sochi). Text in Japanese. (Asignee not given.) Japan. Pat. Sho 46-31356. 2p., Oct. 29, 1971. (Appl. Feb. 20, 1969, 1 claim).*

Water is circulated through two pipe systems to jet spray nozzles at the top of the collector. The dust containing gas is forced into the upper chamber of the collector where it is washed by the spray mist and reaches the horizontal partition. A number of cylinders with a closed top and small gap between the cover and the partition are installed, extending into the lower chamber. Each cylinder is made of an inner wall with many holes and an outer wall with no holes. The gas goes through one film of water between the horizontal partition and the cover of the cylinder, and another water film between the inner and outer cylinders after coming through the holes of the inner cylinder. Dusts and toxic gases in the exhaust air are completely washed down by the time the air is emitted. The water which escapes from the slightly larger holes at the bottom of the inner cylinder will be collected in the tank below, and after being filtered through, returns to the water supply pipes.

17187 APTIC NO. 35936

Aoki, Teruo

DUST COLLECTOR. *(Shujin sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-31355. 2p., Oct. 29, 1971. (Appl. Jan. 9, 1969, 1 claim).*

The circulation pump sends the water in the tank through a neutralized liquid tank and supply jet spray through the nozzles installed at various levels of this tall, thin, vertical wet-type dust collector. The exhaust gas is supplied from the lower part of the cylinder, just above the sludge collector and filter. The gas rises and goes through the first spray and reaches the contact layer filter. There large particles are eliminated, and after going through two more sprays, reaches the horizontal wall dividing the cylinder into two sections. A number of smaller cylinders are inserted through this partition, and inside the cylinders are a multiple number of holes. At the top of each cylinder is a cap containing a nozzle spraying water. The exhaust gas goes through several layers of water film and toxic materials are completely eliminated. Dusts are washed down by the shower. Particles are filtered through at the bottom, and the water goes back to the water tank, while sludge is discharded from a pipe.

17188 APTIC NO. 35942

Aoki, Teruo

DUST COLLECTOR. *(Shujin sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-36149. 2p., Oct. 23, 1971. (Appl. Jan. 7, 1969, 1 claim).*

In a vertical cylindrical dust collector with an exhaust gas entrance at the top, a horizontal partition separates the collector into upper and lower chambers. A number of long pipes extend through the partition. The pipe forms a U-shape bottom, where a semi-circular water recepticle is formed. On the upper part of the wall of the upper chamber are two levels of nozzles which jet spray the water from the pipes over the entering exhaust gas. The gas is forced down the pipes and goes through the pool of water at the end of each pipe. When the exhaust gas contains much dust and toxic gas, the partition and pipes may be repeated in another layer. Since the air is forced down constantly, the gas spouts up a film of water as it goes out of the pipe, and colliding into the ceiling of the partition, turns around and goes through the film of water and escapes. By the time the air reaches the stack, it is completely free of dust and toxic gases. It goes through a water separator installed in the stack and exits.

17189 APTIC NO. 35340

Backus, Eugene

MINICIPAL INCINERATOR DEFEATS POLLUTION/CORROSION PROBLEMS. *Civil Eng. (N. Y.), 41(12):48-49, Dec. 1971.*

Particulate emissions from a new municipal incinerator in Connecticut are substantially below the limit set by the state air pollution code (0.4 lb per 1000 lb flue gas, corrected to 50% excess air). Incinerator effluent is treated in a two-stage venturi scrubber designed to handle a maximum of 67,100 cfm of dry gas and 9300 cfm of water vapor. Corrosion problems in the scrubbing system are minimized by extensive use of reinforced polyester equipment: ductwork, separator, stack, and recyle system piping. The scrubber, handling gas to 1550 F, is acid brick protected, rubber-lined steel. Thus corrosion from flue gases containing hydrochloric acid, sulfur dioxide, sulfur trioxide, and volatile chlorides is minimized.

17190 APTIC NO. 35526

Badowska, Irena

STUDIES ON THE PRODUCTION OF SULPHURIC ACID FROM GASES OF LOW SULPHUR DIOXIDE CONCENTRATION BY CATALYTIC SOLUTION METHOD. *(Badania nad otrzymywaniem kwasu siarkowego metodakatalizy roztworowej z gazow o malym stezeniu dwutlenku siarki). Text in Polish. Przemysl Chem., 50(9):577-579, 1971. 10 refs.*

The production of sulfuric acid from gases with 0.75-5.0% sulfur dioxide by catalysis was studied. Concentrations of SO2 and either iron sulfate or manganese sulfate catalysts were varied. The rate of the reaction and the amount of SO2 conversion depended on the temperature, concentration of the catalyst, and the gas flow rate, but did not depent on the SO2 concentration. Iron sulfate was more effective as a catalyst than MnSO4, particularly when the process involved a greater concentration of sulfuric acid. The diameter of the apparatus and the apparatus s construction material (with the exception of copper) had very little effect on the process.

17191 APTIC NO. 35286

Bagwell, F. A. and R. G. Velte

NEW DEVELOPMENTS IN DUST COLLECTING EQUIPMENT FOR ELECTRIC UTILITIES. TI-5 PUBLIC UTILITIES COMMITTEE SURVEY REPORT NO. 1. *J. Air Pollution Control Assoc., 21(12):781-782, Dec. 1971.*

The power industry is beginning to use electrostatic precipitators designed for coal-firing in connection with oil-fired operations. At least five large (400-800 mw) precipitators were designed for oil-fired steam generators. Two of these have water-filled dust hoppers; a third utilizes a water transport system, although the hoppers remain dry. Major requirements for precipitators for stack gases from oil, compared to coal, are lower velocity, longer gas-treatment path, higher electric energy supply, continuous regulated rapping of plates, and provisions insuring that ash in hoppers does not form a cement. Other utilities are using venturi scrubbers for both sulfur dioxide and dust removal. Objections to wet scrubbing systems are that they reduce stack gas temperature and increase moisture content, with subsequent plume formation. The technology for gag filterhouse application in SO2 removal is not as well developed as for wet scrubbing systems. Mechanical collectors are not effective for small particles, but are often used before or after electrostatic precipitators: in the former location, to reduce the load on the precipitator; in the second location, to catch material dislodged from collecting plates during rapping.

17192 APTIC NO. 35044

Banczyk, Leon

PROCESSING INTO SULPHURIC ACID OF GASES OBTAINED FROM PHOSPHOGYPSUM ROASTING. *(Przerob na kwas siarkowy gazow otrzymanych z prazenia fosfogipsu). Text in Polish. Przemysl Chem., 50(7):p. 450-451. 1971. 3 refs.*

The increased production of phosphoric acid caused a major problem of waste material in the form of phosphorous gypsum. The dumping of the big quantities of this waste material is expensive and requires a great deal of space. Its disposal in the sea is impossible because of the bad condition of the seashore where the plants are located. 0As various tests have shown, this waste material can be utilized as raw material in the production of sulphuric acid. The sulfur dioxide of the gaseous phase produced by calcination of the phosphorous gypsum is subjected to catalytic oxidation and then converted into sulfuric acid. This process is not without hazards, as the catalytic mass is poisoned in the process by the fluorine which appears in a gaseous phase. This leads to a decline in the activation capability of the catalyst. By eliminating fluorides from the gas, sulphuric acid can be produced from huge quantities of the waste material. Although there are economic and safety features in this approach, this is neither the only nor the final solution of this problem.

17193 *APTIC NO. 35094*

Baudelaire, Jean

ACTION IN THE LIME AND CEMENT INDUSTRY. (Action dans l industrie des chaux et ciments). Text in French. Pollut. Atmos. (Paris), vol. 13:40-43, Oct. 1971.

To make one ton of cement requires the pulverization of 2.5 tons of raw materials. The difference represents mostly water, carbon dioxide and dust. The dust particles which constitute a nuisance are fine particles emitted by the stacks up to a distance of one km from the source. Dust from drying ovens, from the handling of clinker, and from storage represents a nuisance for the plant grounds. Studies made in Germany showed that dust concentrations in the vicinity of cement plants do not endanger animals, and, in the case of crops, only the quantity of dust fall counts. Silicosis has never been observed among workers unless they suffered from some other occupational disease. Generally, control of dust emitted at low temperatures has been satisfactorily solved by various fabric filter systems and by electrofilters. The problem is emissions from ovens because of their high temperature, high humidity, and volume (four cu m for the wet, two cu m for the dry method per kg clinker). Results of oven dust control by electrostatic filters can not always be predicted because of the variability in materials. In the last three to four years the dust emitted into the atmosphere amounted to half a percent of the production. The current maximum permissible dust level in combustion gases from cement kilns is 150 mg/cu m. Investment in dust control installations in new cement plants represents 12% of the total investment, in old plants eight percent.

17194 APTIC NO. 35307

Beavon, David K.

ADD-ON PROCESS SLASHES CLAUS TAILGAS POLLUTION. *Chem. Eng., 78(28):71-73, Dec. 13, 1971.*

A new process is described for use with a Claus sulfur removal unit. Claus tailgas usually contains its sulfur values principally in the form of hydrogen sulfide and sulfur dioxide, with substantial amounts of elemental sulfur, carbonyl sulfide, and carbon disulfide. A number of proven processes are available for removing virtually all H2S, but the other sulfur values in the Claus tailgas pose plugging and other problems which hinder direct use of such routes. By hydrogenation under moderate conditions of temperature and pressure, in the presence of a cobalt-molybdenum catalyst, it was possible to convert a larger percentage of the sulfur values to H2S. To recover H2S, the Stretford process was chosen. Sodium carbonate solution reacts with H2S to form sodium hydrosulfide.

17195 APTIC NO. 35740

Bell, David George, Christopher John Hyatt, and John Brian McGarry

CENTRIFUGAL SEPARATORS. *(Ministry of Technology, London (England)) U. S. Pat. 3,581,477. 5p., June 1, 1971. 6 refs. (Appl. Feb. 17, 1969, 5 claims).*

Centrifugal separators with helical-vane swirlers are of small diameter and have small volume flow. Where large volume is required, several separators are assembled into panels, which results in a relatively large frontal area in relation flow. Another disadvantage is that an uncontrolled vortex may be set up leading to undesirable flow losses. In a new centrifugal separator, the helical vane extends along a cylindrical tube and is surrounded by an annular space. Air passing along the center of the tube is swirled by the vanes and dust particles or other foreign matter are centrifuged into the annular space. Here they are entrained by an axial flow that is subsequently diverted from the main stream and deswirled. The annular space can be divided circumferentially by radial vanes extending along the tube. A number of tubes can be assembled into a panel, hexagonal tubes allowing a more compact panel to be obtained. Generally, the vane assemblies will be arranged to swirl the flow in the same angular direction. Trefoil baffles in the interstices between adjacent assemblies prevent formation of undesirable circulation patterns. The continuous helix controls the rotation of core air with a minimum of losses by ensuring smooth transition from axial to rotary to axial flow and also permits the formation of stronger vortices without breakdown. Potential losses are reduced since air that passes away with foreign matter is not centrifuged. (Author abstract modified)

17196 APTIC NO. 35448

Berly, Edward M., Melvin W. First, and Leslie Silverman

REMOVAL OF SOLUBLE GASES AND PARTICULATES FROM AIR STREAMS WITH SPECIAL REFERENCE TO FLUORIDES. *Atomic Energy Commission, Washington, D. C., Contract AT(30-1)-841, Rept. NYO-1585, 49p., April 18, 1952. 16 refs.*

High efficiency absorption of soluble or reactive gases can be obtained with available equipment using wetted fiber beds. Wetted fibers are many times more efficient than Raschig rings or Berl Saddles when compared on the basis of equal volumes. When compared on the basis of weight of packing, one pound of 78-micron diameter Saran fibers are about 150 times more efficient for the absorption of hydrogen fluoride gas than one pound of 1/2-inch Raschig rings. This reduction in weight and bulk can be utilized to realize important savings in construction and maintenance of gas absorbing systems. A five-stage system of concurrently-wetted fiber beds and countercurrent stages can produce 75% hydrofluoric acid from 19.8% HF gas and give a gaseous effluent which is hygienically safe. High efficiency collection generally requires the addition of a droplet eliminator composed of a 1-inch to 2-inch depth of dry fibers less than 5 microns in diameter. For particulate collection, best results are obtained when particles and the surfaces on which they are to be deposited are of the same size. When treating gas streams containing inert particles, the absorbing stages can be protected from fouling and plugging by the use of an impingement device as a prefilter. (Author summary modified)

17197 APTIC NO. 35223

Bernstein, L. S., K. K. Kearby, A. K. S. Raman, J. Vardi, and E. E. Wigg

APPLICATION OF CATALYSTS TO AUTOMOTIVE NOX EMISSIONS CONTROL. *Preprint, Society of Automotive Engineers, Inc., New York, 17p., 1971. 10 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710014.)*

Nickel-copper alloys, marketed under the name Monel, are extremely active oxides of nitrogen reduction catalysts. At temperatures above 1300 F, and under net reducing conditions, Monel will catalyze the removal of 90% or more of the nitric oxide in automotive exhaust at space velocities of up to 100,000 v/v/hr. On unleaded fuel, Monel catalysts have shown good activity maintenance in mileage accumulation runs as long as 31,000 miles. Catalyst life is limited by physical deterioration of the catalyst which causes increases in exhaust back pressure. The presence of lead in the fuel substantially increases the rate of Monel deterioration. When Monel is used as part of a dual-bed catalyst system, two problems arise which appear to be generic to dual-bed catalyst systems. First, under normal operating conditions, roughly 10% of the nitric oxide in the untreated exhaust reacts with hydrogen to form ammonia in the Monel bed. The NH3 thus formed can be oxidized in the oxidation bed. Ammonia formation can be decreased by careful control of exhaust composition. Alternatively, the concentration of NO in the untreated exhaust can be lowered by exhaust gas recycling, so that even with ammonia formation, the nitric oxide concentration in the treated exhaust will be low enough to meet low emissions standards. Second, placing Monel or any other NOx reduction catalyst ahead of the oxidation catalyst slows the warm-up of the oxidation catalyst. This problem has been attacked by placing the catalyst system close to the exhaust ports and modifying the exhaust system to conserve exhaust gas sensible heat. (Author abstract modified)

17198 APTIC NO. 35886

Bingham, Edward C.

AIR POLLUTION PROBLEMS AT A NITROGEN FERTILIZER PLANT. *Rhode Island Univ., Kingston, Coll. of Engineering and Greater Providence Chamber of Commerce, R. I., Proc. North Eastern Regional Antipollution Conf., 4th, Kingston, R. I., 1971, p. 113-121. (July 13-15.)*

At the second largest single train nitric acid plant in the world, a 500 TPD Weatherly unit, a catalytic type tail gas combustor or plume eliminator was included in the plant design for about $50,000. additional cost. The combustor vessel is packed with ceramic blocks which are impregnated with a platinum catalyst. The amount of fuel must be in excess of the stoichiometric requirement for complete oxygen combustion. For pollution control, conversion of the oxides of nitrogen to nitrogen is required and is achieved by the addition of more fuel and the presence of the proper catalyst. By using hydrogen as a fuel instead of natural gas, a high degree of oxygen removal is achieved. The heat energy generated by the oxidation of the added fuel is profitably extracted by the high temperature gas expander mechanically connected to the air compressor of the ammonia oxidation system.

17199 APTIC NO. 35947

Bjerle, Ingemar

ABSORPTION CLEANING OF FLUE GASES AND SMOKES. *(Rening av rok- och avgaser genom absorption). Text in Swedish. Kem. Tidskr., 83(9):34-39, Sept. 1971. 4 refs.*

Since large volumes of gases are to be handled in smoke and flue gas cleaning, it is imperative that absorption occur fully within a limited reactor space on large contact surfaces without an excessive drop in pressure. Various types of absorbers such as Bahco-scrubber, fluidized-bed absorber, nozzle jet absorber by BASF, and laminar multi-jet absorber are described. Sulfur dioxide is absorbed in alkaline suspensions of calcium hydroxide or calcium carbonate. The corresponding reactions are given. As SO2 is always accompanied by carbon dioxide in smokes and flue gases, SO2 has to undergo selective absorption, though the rate of SO2 absorption is different from that of CO2. Reactions and theoretical explanations are given. Absorption of SO2 is controlled by the gas phase while CO2 absorption is controlled by liquid phase. An example is given for the design of a multi-jet absorber. Reactor lengths are calculated for different cases (instantaneous reaction on surface, physical absorption). Total absorption volume is computed for a thermal power station of 25 MW.

17200 APTIC NO. 35654

Blume, J. H., D. R. Miller, and L. A. Nicolai

REMOVE SULFUR FROM FUEL OIL AT LOWEST COST. *Hydrocarbon Process., 48(9):131-136, Sept. 1969. (Presented at the American Institute of Chemical Engineers, New Orleans, La., March 1969.)*

Relative advantages, limitations, and costs are explored for several hydrodesulfurization routes to low-sulfur fuels: hydrodesulfurization of atmospheric residuum; hydrodesulfurization of vacuum gas oil (VGO); and hydrodesulfurization of vacuum gas oil coupled with hydrodesulfurization of the deasphalted vacuum bottoms (VGO/DAO). On an overall basis, residuum hydrodesulfurization yields a product with 1.1% sulfur, corresponding to a 75% desulfurization. VGO desulfurization produces a 3.1% sulfur fuel oil, corresponding to a 28% desulfurization. The combined VGO/DAO process makes a 2.4% sulfur product, corresponding to 44% desulfurization. Therefore, the choice of process will depend on both economics and product sulfur requirements. Investment and operating costs are highest for residuum hydrodesulfurization and lowest for the VGO process; the economics of the residuum process can be improved, however, by processing at low pressure. When pressure is reduced, the savings in equipment cost can more than offset the cost of the increased catalyst volume.

17201 APTIC NO. 35285

Bohn, Hinrich L.

A CLEAN NEW GAS. *Environment, 13(10):4-9, Dec. 1971. 13 refs.*

Organic urban and agricultural wastes currently pose a disposal problem. Conversion of these wastes to methane by anaerobic digestion would provide a clean fuel that could almost double the United State s natural gas supply. Anaerobic digestion, or microbial fermentation, yields a gaseous mixture of up to 72% methane, 25% or more carbon dioxide, plus small amounts of hydrogen, water vapor, ammonia, mercaptans, hydrogen sulfide, and volatile amines. The additional gases could be recovered by cold traps and chemical scrubbers. Sewage water would be an ideal source of the water needed for anaerobic digestion because of its nutrient and organic content. Carrying out the fermentation at slightly below atmospheric pressure would increase gas production and would purge the water and sludge of much of their dissolved gases. The sludge remaining from fermentation could be disposed of by incineration, land spreading, and land fill, or used to make fuel. The water remaining may be suitable for reclamation by land spreading and irrigation. If so, oxidative treatment to remove organic matter would be unnecessary.

17202 APTIC NO. 35165

Brandes, A.

ENVIRONMENTAL PROTECTION AND SAFETY MEASURES AT THE VAHR POWER STATION. *Tech. Ueberwach. (Duesseldorf), 5(8):285-291, 1964. 15 refs. Translated from German. Central Electricity Generating Board, London (England), Information Services, 16p.*

Pollution control, safety measures, and air pollution measurements effected by the Vahr power generating plant are examined. The major sources of pollution were the gas turbines and oil-fired boilers which emitted sulfur dioxide. Measurements of SO2 concentrations correlated with distance from power station, wind direction, and stack height, and determined background pollution concentration as 0.2 mg/cu m (95% of the measurements). Introducing variable meteorological factors, groundlevel concentration was determined by a propagation equation. Control and safety measures included low sulfur and ash content of fuel oil (2.5 and 0.02%), prevention of high-temperature corrosion, cooling of combustion gases, noise prevention, ventilation, temperature monitoring, and combustion and fuel control.

17203 APTIC NO. 35977

Brandes, Hermann

EXPERIMENTAL STUDIES OF CENTRIFUGAL SEPARATORS. PART I. *(Experimentelle Untersuchungen an Fliehkraftabscheider Teil 1.) Text in German. Energie Tech., 23(8):283-290, Aug. 1971. 12 refs. PART II. (TEIL 2). Ibid., 23(9):325-330, Sept. 1971. 17 refs.*

The pressure loss, collection efficiency, and the properties of the vanes used for imparting a rotary movement on the gas flow were studied among other parameters. The operating conditions of the centrifugal separator were simulated with a water/air mixture. The mixture entered the separator through a vertically rising entrance tube. The mixture was then deflected to a canal with guide vanes where the mixture started rotating. The water was thrown to the wall while the air concentrated in the center. The pressure loss of the centrifugal separator could be well expressed both with the aid of simplified assumptions concerning the flow characteristics, as well as by similarity considerations. It was much more difficult to express the collection efficiency in a generally valid form. The separation process is obviously so complex that approximate solutions had to be used for setting up a calculation program which permits the design of such parameters over a large range of geometrical and operational parameters. Extrapolations will lead to considerable errors. Experiments under operating conditions are indispensable. The extent of the experiments can be reduced through application of the results gained by the studies with the water/air mixture.

17204 APTIC NO. 35857

Brehob, Wayne M.

MECHANISMS OF POLLUTANT FORMATION AND CONTROL FROM AUTOMOTIVE SOURCES. *SAE (Soc. Automot. Engrs.) Spec. Pub., no. 365:24-39, June 1971. 20 refs.*

The sources of automotive pollution, causes of exhaust emission, and methods of emission control are reviewed. Uncontrolled automotive gaseous pollutants include hydrocarbons, carbon monoxide, and nitrogen oxides from the fuel system, the crankcase, and the exhaust pipe. Emission control accomplishments with respect to emission regulations and standards are examined. Emission controls by engine modification include mixture leaning, improved mixture quality, inlet air heating, increased idle speed, spark retard, reduced compression ratio, reduced chamber surface-to-volume ratio, and increased valve overlap. Advanced emission control systems, e.g., thermal reactors, catalytic exhaust reactors for oxidation or chemical reduction, exhaust gas recirculation, and heterogeneous combustion, and future control concept packages, including thermal reactors and exhaust gas recirculation systems, are reviewed.

17205 APTIC NO. 35885

Breitbach, Peter, Jacob Kleisinger, and Heinz Langer

FILTERING LAYER MANUFACTURING METHOD AND MEANS. *(Filterschicht, Verfahren und Mittel zu ihrer Herstellung). Text in German. (Seitz-Asbest-Werke Theo. and Geo. Seitz, Bad Kreuznach (West Germany)) Swiss Pat. 506,316. 5p., April 30, 1971. (Appl. April 16, 1970, 3 claims).*

A rectangular filtering layer made of organic or inorganic fibers and folded in U-form over the plates or frames of a filter press is presented. The filter sheet is reinforced by a flexible fabric strip wider than the two parallel pre-formed folding grooves. The strip divides the filter sheet into two areas of equal size which when folded over a filter plate, cover it on both sizes. The reinforcing strip, made of nonelastic yarn, is attached to the filter sheet on a continuous belt from a dispenser roll. The fabric strip becomes entwined with the fibers of the wet sheet filter and subsequently adheres to it through the action of a suction device on the underside of the conveyor belt. The reinforcing strip can also be sprayed on the filter sheet in the form of a strip of plastic solution or watery plastic emulsion which solidifies to a reinforcing spine when the liquid evaporates in a dryer.

17206 APTIC NO. 35944

Brocke, W.

OIL BURNER SOOT EMISSION. *(Russabscheidung bei Oelfeuerungen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:279-285, 1970. 19 refs.*

Particulates emitted in the gases from properly adjusted oil burners amount to 10 mg/cu m for evaporator burners, and 5.0 mg/cu m for spray burners. Particulates from oil burners contain from 10-100 mg vanadium per kg and approximately 12% sulfuric acid. Oil burners emit 0.25 to 8.0 kg particulates per ton oil: 60-70% in normal operation and 30-40% during soot emission periods. The soot is combustible by 75-95%. Commercial centrifugal separators remove 60 mg/cu m particulates for heavy oil with a sulfur content up to 2.8%. Electrostatic precipitators perform better but are more expensive. The installation of a dust arrester will generally limit soot emissions to 0.6 kg/t oil. A representative power plant emitted 1.7 kg particulates/t oil without, and 0.5 kg particulates/t oil with a dust arrester. During 6500 operational hours/year, 13 cu m waste gas was emitted per kg oil. The investment cost for dust arresters was one dollar/cu m waste gas for oil plants; 75 cents/cu m waste gas for new plants. An overall investment of 10 million dollars in control equipment in the German Federal Republic would prevent the emission of 6400 t particulates from oil burners. This would amount to about 25 cents per ton heating oil. The corresponding figures for Nordrhein-Westfalen are 1600 t particulates and an investment of two and a half million dollars.

17207 APTIC NO. 35665

Browder, Tim J.

LATEST DEVELOPMENTS AND MODERN TECHNOLOGY IN THE SULFURIC ACID INDUSTRY. *Preprint, American Institute of Chemical Engineers, New York, N. Y., 27p., 1970. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 63rd, Chicago, Ill., Nov. 29-Dec. 3, 1970.)*

One of the most effective methods of reducing sulfur dioxide emissions from sulfuric acid plants is by use of a new patented double contact/double absorption sulfuric acid system, high efficiency demisters, and if necessary, final wash towers using an SO2 absorbent. This process permits more flexible operation, more stable catalyst bed temperatures, and great savings in start-up time. Existing plants can easily be modified by addition of heat exchangers, an absorption tower, pump tank, and coolers. In many cases the addition of new equipment will increase plant production capacities by approximately 25-30% by changing the gas strength in the plant by the same percentage increase. With the increased equipment and increased production capacity, many older stack effluents can be reduced more than ten-fold. Flowsheets and diagrams of the process are included. Other recent developments in the sulfuric acid industry are Teflon-lined sulfuric acid combustion furnaces, Teflon demister pads for absorption and drying towers, Intalox saddles, and greater use of spherical catalysts.

17208 APTIC NO. 35550

Caffin, D. A., P. B. Linkson, and J. Brough

THE FILTRATION OF AIR USING FIBROUS FILTERS. *Inst. Engrs., Australia, Mech. Chem. Eng. Trans., 7(1):27-31, May 1971. 73 refs. (Presented at the Institution of Engineers, Annual Engineering Conference, Adelaide, Australia, March 22-26, 1971, Paper 2940.)*

The theories and methods which form the basis of the design of fibrous filters are reviewed. The mechanisms whereby particles are entrapped by fibrous filters, and the means of prediction of the overall collection efficiency are discussed. Gravity separation, inertial impaction, direct interception, Brownian diffusion, electrostatic precipitation, eddy diffusion, thermal precipitation, and Brownian agglomeration are mentioned. Of the methods available for the prediction of efficiency, probability theory seems the most promising. It is based on behavior in deep filter beds, it allows for the effect of re-entrainment of particles, and it incorporates an experimentally proven design method for shallow beds, namely, the log-penetration relation. The period of time for which a filter is operated and the conditions of operation are important practical aspects of filter design which must be given careful consideration. The testing methods used for the evaluation of fibrous media are briefly considered. (Author summary modified)

17209 APTIC NO. 35512

Campbell, Roy Edwin and Edwin Eddie Fisher

PROCESS FOR RECOVERING A METAL OXIDE AND SULFUR DIOXIDE FROM METAL SULFATE. (Elcor Chemical Co., Midland, Tex.) U. S. Pat. 3,582,276. 7p., June 1, 1971. 4 refs. (Appl. July 22, 1968, 14 claims).

Since demands for sulfur have been high, new sulfur sources are needed. Calcium sulfate and other metal sulfates are a potential source, but the high cost of converting these sulfates using known methods has prevented their large-scale use. Therefore, an economical method for the recovery of a metal oxide and sulfur dioxide from metal sulfate was developed. The process constitutes a series of reduction and oxidation steps. During the reduction, the sulfate is converted to SO2, the metal sulfide, and the metal oxide. The subsequent oxidizing step converts the metal sulfide to SO2, metal oxide, and a small amount of metal sulfate. The SO2 is collected, and the reduction and oxidation cycle is repeated until a metal oxide of desired purity is recovered. The SO2 can then be converted to sulfur or sulfuric acid. (Author abstract modified)

17210 APTIC NO. 35103

Canisius, Carl and Richard Moebius

A FILTER PAD FOR THE FILTRATION OF GASES AND OF LIQUIDS. *(Filterkoerper zum Filtern von Gasen oder Fluessigkeiten). Text in German. (Norddeutsche Seekablewerke Aktiengesellschaft, Nordenham (Germany)) Swiss Pat. 505,639. 3p., April 15, 1971. (Appl. June 1, 1968, 1 claim).*

The filter pad consists of several coils of a sheet of flexible wire mesh covered with at least one layer of plastic netting. Several coils of this wire and plastic netting are wound on a perforated plastic tube and the thus formed filter candle is inserted into a tight fitting outer perforated plastic tube. The plastic netting which projects somewhat over the wire mesh is heat-sealed on one or on both ends so that the candle cannot unwind. The plastic netting is manufactured cheaply by extrusion. The width of the sheet determines the length of the filter candle, the number of windings the filter candle thickness, and the thickness of the plastic netting the distance between filtering layers. Several layers of plastic netting can be attached to the wire mesh sheet instead of one and coiled into a filter candle.

17211 APTIC NO. 35284

Carbone, Walter E.

COKE-OVEN EMISSION CONTROL. *Iron Steel Engr., 48(12):56-60, Dec. 1971.*

Total emissions (dust, carbon monoxide, hydrogen sulfide, sulfur dioxide, benzene, and tar) from coke oven charging operations can amount to almost six tons/day. A solution to the emission problem may be the pipeline charging of preheated coal to coke ovens. In a typical charging system, coal no larger than one inch is first fed to the flash-drying entrainment section of the preheater unit. Here only particles less than one-eighth inch are removed. Larger particles are suspended until heated to a surface temperature of 700 F and crushed to less than one-eighth inch by a rotating swing hammer. Coal leaving the preheater goes to a primary cyclone where approximately 80% is recovered. Effluent from the primary cyclone is then sent to four or more secondary cyclones where the remaining coal dust is collected. Overall efficiency of the cyclone recovery system is 99.5% of the coal input. Coal from the cyclones is collected on a common screw conveyor and discharged to charging bins. A portion of the gas from the secondary cyclones is recycled back to the combustion chamber, and the balance sent to a wet scrubber. Since the system is completely sealed, no emissions escape to the atmosphere during charging operations. The method also reduces emissions occurring during pushing operations.

17212 APTIC NO. 35303

Cattelain, Claude

METHOD FOR TREATING ZINC BLAST FURNACE GASES. *(Metallurgical Processes Ltd., Nassau (Bahamas) and Imperial Smelting Corp. Ltd., London (England)) U. S. Pat. 3,592,631. 4p., July 13, 1971. 8 refs. (Appl. April 11, 1968, 2 claims).*

A method is presented for conveying zinc blast furnace exit gases from a condenser to a scrubbing tower by means of a dry crossover duct. Prior practice was to use a crossover duct in the form of a downcomer to link the top of the condenser with the bottom of the scrubbing tower. This crossover duct was irrigated with water to attempt to minimize accretion of lead and zinc oxides. However, accetions were still a problem. In the present process, the duct is sloped upward towards the scrubbing tower to return liquid metal to the condenser. The scrubbing tower includes sprays for cooling and saturating the gases in order to avoid accretion at the end of the duct or tower. (Author abstract modified) 0

17213 APTIC NO. 35830

Cave, R. W.

EFFLUENT DISPOSAL IN AN INTEGRATED WORKS. *J. Iron Steel Inst. (London), 209(3):202-209, March 1971. 10 refs. (Presented at the Iron and Steel Institute, Management of Water in the Iron and Steel Industry Technical Meeting, London, England, May 6-7, 1970.) (p. 208 directly concerns air pollution).*

The liquid effluent problem at an integrated steelworks is in toto inevitably large and complex. Amalgamation of the constituent streams before treatment at one main plant raises more difficulties than it solves; in contrast, segregation and selected mixing can bring economies in processing the liquors. This principle is illustrated by several examples. The Ebbw Vale works gives rise to an effluent problem of unusual intensity. An explanation is given, and the measures now being taken to meet the demands of the local river authority are described. The reasons for the choice of the carbonate process are mentioned, and important aspects of the specification of this plant are stressed. Reference is made to the special effluent problems associated with large-scale chemical and electrochemical treatment of steel strip, unexpected side effects, and anomalies in consent conditions. Gas desulfurization is also indicated. Finally, the possibility of making effluent treatment economically viable is considered, having in view the recovery of water, nickel, and chromium. (Author abstract modified)

17214 APTIC NO. 35171

Chilcote, David O.

ALTERNATIVES TO OPEN BURNING AND BASIC PHYSIOLOGICAL STUDIES. *In: Research Relating to Agricultural Field Burning. A Progress Report. Oregon State Univ., Corvallis, Agricultural Experiment Station and Oregon State Univ., Corvallis, Air Resources Center, p. 19-20, Feb. 1971.*

Various burning techniques to determine emission characteristics and possibilities for improving combustion under open burning conditions were examined. Techniques tested included backfiring or burning into the wind; steady-state firing in which a single flame front across the field was allowed to burn with the wind; and burning fields by firing the periphery. Improvements were based on combustion, as observed by the change in smoke density, and reduced entrainment of particulate matter. Alternatives to burning crop residue were studied, including incorporation of the material into the soil and its subsequent recycling by soil microorganisms. Physiologic and ecologic studies of the effects of burning on perennial grasses air in progress.

17215 APTIC NO. 35970

Christen, Gilbert and Marcel Lefort

PROCESS FOR SEPARATION OF A GAS. *(Procede de separation de gaz). Text in French. (Rhone-Poulence S.A., Paris (France)) Swiss Pat. 496,463. 4p., Nov. 13, 1970. (Appl. Feb. 11, 1969, 4 claims).*

A process for gas separation by organosiliceous polymers membranes with superior permeability and selectivity characteristics is described. These membranes have a greater selectivity than conventional membranes of various synthetic polymers. The invention provides an improved method for separating at least one constituent of a gas mixture, particularly a mixture comprising carbon dioxide gas, oxygen, nitrogen and helium. Part of the gas stream passes through the membrane where an enriched mixture of at least one gas can be drawn off from one side of the membrane. A polymer of vinyl trialcoylsilane, which has an intrinsic viscosity, measured at 25 deg in cyclohexane, of over 100 cu cm/g is recommended. The polymer is prepared by polymerization of the monomer in the presence of an anionic catalyst such as lithium in metallic form, or an organometallic compound of lithium. To transform the material into membranes, a solution containing the polymer, stabilizers, and plasticizers is evaporated. The thickness of the membranes can vary from 1 to 500 micron, depending on the application.

17216 APTIC NO. 35447

Chulakov, P. Ch. and U. B. Baytasov

EFFICIENCY OF DUST-WETTING AGENTS IN AIR DUST REMOVAL. *(Effektivnost primeneniya pylesmachivayushchikh dobavok). Text in Russian. Izv. Vysshikh. Uchebn. Zavedenii, Gorn. Zh. (Sverdlovsk), 13(6):66-68, 1970. 4 refs.*

Experiments on air purification were conducted in a high speed dust collector consisting of a venturi pipe and droplet collector, using water solutions of sulfonated substances (purified alkyl sulfanate and sulfite-alcohol malt) which posses surface activity and are water soluble. Surface tension of both solutions on the water-air boundary was determined in the concentration range 0.001-0.1% at 17 deg and increased only slightly with concentration. The use of the above solutions improved air purification at relatively low velocities of flow through the nozzle of the venturi pipe. Optimum flow velocity through a venturi nozzle has to be determined experimentally, since its increase above a certain value results in suds formation which highly dispersed dust can penetrate. The two solutions studied are suitable for short-term use only since they lose their dust-wetting ability with time.

17217 APTIC NO. 35699

Cranford, James M.

OVERHEAD CLEANING EQUIPMENT - ELIMINATION OF ELECTRICAL PROBLEMS. *Preprint, Inst. of Electrical and Electronics Engineers, New York, 10p., 1970. (Presented at the IEEE (Institute of Electrical and Electronics Engineers), Textile Industry Conference, Atlanta, Ga., May 14, 1970.)*

Electrical reliability of automated overhead cleaning equipment used in different textile processes requires proper design of components and proper installation and maintenance procedures. Design criteria include conductor bars made of a material with good electrical conductivity and machining qualities. Equally important are the mounting of the insulating holders for the conductor bar system, the design of system joints, and the installation of locking anchor blocks. The brush block assembly that takes power from the conductor bars must have excellent wear characteristics, and provisions must be made to protect the motors powering the overhead cleaning system. Preventive maintenance to assure continued operation of the system includes periodic checks of the conductor bar and brush block.

17218 APTIC NO. 35995

Cross, Frank L., Jr.

AIR POLLUTION CONTROL. *Preprint, Dept. of Commerce, Washington, D. C. and Water Pollution Control Federation, Washington, D. C., 17p., 1971. (Presented at the Technical Conference on New Technology in the Solution of Practical Problems in Air and Water Pollution Control, Tokyo, Japan, Dec. 7, 1971.)*

An uncontrolled refinery with an 100,000 barrel per day capacity, could emit up to 17,000 pounds per hour of different particulate and gaseous emissions. The hypothetical refinery, with the application of the latest control technology, would emit approximately 1700 pounds per hour of pollutants. The principal sources of refinery emissions are cited. One of the basic control systems at the refinery is the recovery system applied to the catalytic cracking unit. An electrostatic precipitator of 95% efficiency is utilized for recovery of particulates from this unit, while carbon monoxide generated from this process is burned in a carbon monoxide boiler. From various refinery sources, gases such as hydrogen sulfide can be converted to elemental sulfur or to sulfuric acid in a sulfur recovery plant. An incinerator for burning waste sludge can be equipped with a wet scrubber, and the flares would have steam injection systems to convert carbon monoxide to carbon dioxide. The impact of application of the latest state-of-the-art controls on the ambient air quality in the vicinity of the hypothetical factory is illustrated. In any region having high background pollutant concentrations, unless all sources in the area are reduced over a period of time, it would be very difficult to justify any other industry locating in the area.

17219 APTIC NO. 35295

Dayton, Stan

WET SCRUBBING OF WEAK SO2 GETS A TRIAL AT NEW MCGILL PILOT PLANT. *Eng. Mining J., 172(12):66-68, Dec. 1971.*

Preliminary results are reported for a pilot plant limestone scrubbing system installed at a copper smelter. Designed to handle both dilute reverberatory gas (0.2 to one percent sulfur dioxide) and concentrated converter gas (four percent or more SO2), the pilot plant uses ground wet limestone to fix sulfur as a calcium sulfate. Primary reactors are a venturi scrubber and a turbulent contact absorber (TCA). Prior to limestone scrubbing, smelter gas is cooled and cleaned with a water wash in a cooler scrubber. All low-magnesium limestones tested appear equally reactive and, in general, more reactive than high-magnesium limestone. About eight pounds of limestone are required per pound of sulfur treated. This raises a problem for smelters at a distance from a concentrator, since they have no readily available tailing pond. Operating on 0.4% SO2 gas, sulfur recovery efficiency is 70%. On a gas feed of 0.7% SO2, the conversion factor is only 50%. Neither figure would permit an existing smelter with an acid plant for converter gas and a limestone scrubbing unit taking gas from a tightly hooded reverberatory to achieve the 90% sulfur recovery standard legislated by several states.

17220 APTIC NO. 35945

Dergachev, N. F. and M. S. Khar kovskii

PREVENTION OF DEPOSIT FORMATION IN SCRUBBERS. *Thermal Eng. (English translation from Russian of: Teploenergetika), 18(2):70-75, Feb. 1971. 9 refs.*

During operation of scrubbers at power stations, deposits form in the inlet connection, on the grids, and on the casing of the scrubber. These deposits interfere with gas flow in the scrubber, increase its resistance, and decrease scrubbing efficiency. The chemical and mineralogical compositions of deposits formed in the inlet connection are virtually the same as the composition of the fly ash of the fuel burnt, and the composition of deposits at the upper spraying nozzles is virtually the same as the composition of the fly ash in the scrubbed gases. One of the methods for combating deposits in inlet connections of scrubbers is their periodical removal by a water jet. A radical method of combating deposits is to eliminate the cause of their formation, which is the transition zone. Other methods of controlling deposit formation are cited.

17221 APTIC NO. 35115

Descolas, Jean

ACTION OF BUILDERS OF SEPARATORS AND OF SCRUBBERS. *(Action des constructeurs de separateurs et epurateurs). Text in French. Pollut. Atmos. (Paris), vol. 13:48-51, Oct. 1971.*

Dry dust arresters are steadily gaining over wet one because they eliminate the sludge problem. Still, the venturi scrubber has found wide application in the steel industry in the purification of gases from blast furnaces. Bag filters are also widely used because of their high efficiency and their dry dust recovery. Newer models tolerate higher temperatures than older ones, thus broadening their field of application (glass wool tolerates up to 315 C). Electric filters have also vastly improved (emission electrodes with increased mechanical resistance), as have scrubbers which absorb sulfur dioxide, fluorine, and other noxious or malodorous gases. Modern scrubbers work with solutions of various chemical compounds. An increasing number of industries is introducing them (the aluminum industry for fluorine control and the cellulose industry for the control of mercaptans). Of all dust arresters, cyclones account for 15%, wet dust arresters for 20%, electrical dry and wet dust arresters for 35%, bag filters for 25%, and other systems for five percent. The investment in dust arresters per capita in France comes to two Francs, thus France is in fifth place behind Sweden, United States, West Germany, and England. A 15-20% yearly increase in expenditures for purification equipment can be foreseen.

17222 APTIC NO. 36015

Dickter, William and M. A. Schultz

INVESTIGATION OF A DEVICE USING RADIATION TO CHARGE AND COLLECT PARTICULATE MATTER. *Nuclear Technol., 12(2):243-245, Oct. 1971. 5 refs.*

An ionization precipitator chamber with a radioactive cobalt(60) pencil for particle charging was tested for its ability to collect aerosol-formed high-resistivity salt particles having a median diameter of 0.7 micron. Collection efficiencies of 70% were measured with a nonoptimum geometry. Theoretical considerations indicate that higher efficiencies can be obtained by reducing the 0.75-inch gap between electrodes. The present efficiency is plotted as function of voltage and dose rate voltage across the electrodes.

17223 APTIC NO. 35722

Doxey, G., G. E. Hodgkinson, and G. Woodhouse

NOTE: SOME USES OF CALCIUM CHLORIDE AS AN ADDITIVE TO BOILER COALS. *J. Inst. Fuel, 40(322):521-535, Nov. 1967. 11 refs.*

The addition of 0.5% by weight calcium chloride to coal prevented freezing of the coal even at 22 F. There was no evidence of increased corrosion of chutes, hoppers, or coal wagons. Similarly, CaCl2 in concentrations up to 0.25% by weight had no serious effect on the rate of fouling or corrosion of boilers. Concentrations as low as 0.01% by weight had a beneficial effect on fireside boiler deposits, making them softer, more friable, and easier to remove. The addition of 0.2-0.3% by weight CaCl2 to coals fired on stokers reduced grit emissions by 25-45%. Dust emissions also appeared to be reduced by the addition of CaCl2 to coal fed to a pulverized-fuel boiler equipped with an electrostatic precipitator. (Author conclusions modified)

17224 APTIC NO. 35505

Drissel, G. M., R. M. Gialella, and A. G. Sliger

REMOVAL OF SO2 FROM POWER PLANT FLUE GASES USING THE ALKALIZED ALUMINA PROCESS. (FINAL REPORT). *Kellogg (M. W.) Co., Piscataway, N. J., Research and Engineering Development, Air Pollution Control Office Contract PH 86-68-86, APTD 0688, Rept. RED-70-1233, 479p., Feb. 28, 1970.*

NTIS: PB 200881

The alkalized alumina process for removing sulfur dioxide from power plant stack gases was investigated with respect to attrition, sorption, regeneration, pilot plant and commercial scale studies, and economic factors. Kinetic models for the mechanism of SO2 removal were examined. Removal efficiency, set at 90%, was satisfactorily achieved in the fixed and fluid bed systems but not in the dispersed phase unit. The presence of about one percent iron in the sorbent increased the rate of regeneration gas consumption and resulted in more complete sulfur removal. Various gases were tested for single step and two step regeneration and the effect of sorbent sodium concentration and temperature on regeneration was determined. The entire plant for testing included a steam-methane reformer, a Claus plant, an electrostatic precipitator, and an air preheater. Annual costs, investments, and incremental costs for the system are included. 0

17225 APTIC NO. 35442

Eastlund, Bernard J. and William C. Gough

ENERGY, WASTES AND THE FUSION TORCH. *Preprint, American Medical Association, Chicago, Ill., 33p., 1971. 38 refs. (Presented at the American Medical Association Congress on Environmental Health, 8th, New York, April 26-27, 1971.)*

Man s future society will eventually have to reach a constant population, which must cope with highly limited resources, and be which must forced to develop a circular or closed materials economy. A fusion torch is suggested as one possible technological route to a stationary-state economy. The basis of the fusion torch concept is to use ultra-high temperature plasmas to vaporize, dissociate, and ionize solid wastes to permit the recovery of valuable elements and compounds for reuse. This concept is described as technically feasible.

17226 APTIC NO. 35557

Elshout, A. J.

THE INFLUENCE OF MGO ON CHEMICAL REACTIONS OF DEPOSITS IN THE HIGH TEMPERATURE SECTION OF OIL FIRED BOILERS. *Mitt. Ver. Grosskesselbesitr., 49(3):182-190, 1969. 28 refs. Translated from German. Central Electricity Generating Board, London (England), Information Services, 17p.*

High temperature corrosion and fouling in oil-fired boilers, the causes of which have not yet been fully explained, remain a much discussed problem which is being met by near-stoichiometric firing and by additives. The additives used have been mainly magnesium and calcium compounds. The influence of magnesium oxide on the chemistry of tube deposits is discussed mainly from the viewpoint of chemical reactions between MgO and oxides of sulfur, sulfates, sodium, and vanadium compounds. The following systems were studied: a vanadium pentoxide-sulfur troxide, vanadium pentoxide-sodium monoxide-sulfur trioxide, and sodium sulfate-iron sulfate-sulfur troixide. MgO works partly as a protective coating on the oxide surface, so that is first converted to sulfate and then in a purely physical manner reduces the diffusion on sulfur dioxide to the tube surface and hence the oxidation of steel.

17227 *APTIC NO. 35958*

Engels, Gerhard

STATE OF THE ART OF DUST ELIMINATION IN FOUNDRIES. (Stand der Staubbekaempfung in der Giessereiindustrie). Text in German. Staub, Reinhaltung Luft, 31(11):436-438, Nov. 1971.

In the Federal Republic of Germany about 800 iron and steel foundries and 900 non-ferric metal foundries existed in 1970. They produce 75,000 tons of dust/year, of which 55,000 tons are retained in dust collectors. The dust collection during sand preparation and distribution, emptying of molds, and old sand return has been technically solved. At a cost of five million dollars/year for investment and operation about 20,000 tons of dust/year are collected. Of the 800 cupola furnaces in existence in 1964, about 30% have been equipped with dust collectors. Twenty percent of the furnaces were replaced by electric furnaces. The costs for dust collection at cupola furnaces between 1964 and 1969 amounted to 10 million dollars. According to the effective regulations, new cupola furnaces may emit only a maximum of 1.5 kg/ton of iron depending on the melting capacity and the operating hours. At older furnaces, the dust emission has been limited to a maximum of 3.0 kg/ton of iron. The amount of cast iron obtained through furnaces equipped with dust collectors and through waste gas free electric furnaces is approximately 70%. The costs for operation and maintenance of the dust collectors for cast iron run at six million dollars/year; dust collection at the production of other foundry products over two million dollars/year.

17228 APTIC NO. 35145

Fattinger, Volker

SCRUBBER WITH DRIP CATCHER. *(Gaswaschanlage mit Tropfenfaenger). Text in German. (Firma Hugo Petersen, Wiesbaden (West Germany)) Swiss Pat. 505,641. 5p., April 15, 1971. (Appl. May 26, 1970, 1 claim).*

A drip catcher which changes gas flow direction twice and achieves high separation efficiency uses polypropylene, polyethylene, or polyvinylchloride V-profile lamellae arranged so that the gas is deflected twice from its course, each time approximately 90 deg, by the double angle formed by the lamellae. The optimal distance between two neighboring lamellae is between three and 11 cm; optimal gas velocity is between two and eight m/sec. The high separation effect is due to the turbulent flow imparted to the gas in the knees formed by the profile of the lamellae. The turbulent flow is achieved only be deflection angles of approximately 90 deg or more. The individual elements of the drip catcher are welded, riveted, or glued together and mounted in a frame forming a screen which is placed across the gas flow. Two such drip catchers can be combined with a conventional scrubber, one inside between two bottoms with cylindrical gas washers (candles), the other in the outlet from the scrubber, before the gases are dispersed into the atmosphere.

17229 APTIC NO. 35180

First, Melvin W., Leslie Silverman, Richard Dennis, August T. Rossano, Charles Billings, Edward Conners, Ralph Moschella, Edward Berly, Sheldon Friedlander, and Philip Drinker

AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952. *Harvard Univ., Cambridge, Mass., Air Cleaning Lab., Atomic Energy Commission Contract AT(30-1)-841, Rept. NYO-1586, 122p., Dec. 16, 1952. 25 refs.*

Investigations on the separation of respirable and irrespirable dusts by cyclone; air sampling with menbrane filters used for dust analysis, acid mists, and metal fumes; sampling of stack gases; and cascade impactors for estimating particulate size distribution are reported as part of a research and development program on air and gas cleaning devices. Test results on the efficiency of electrostatic precipitators and wet collectors (scrubbers and baffles) are presented. Operating variables were determined for reverse jet cloth filters, cloth tube filters, bag collectors, and centrifugal separators. Experimental methods and equipment are described for the removal of soluble gases and particulates from stack emissions, with special reference to fluorides.

17230 APTIC NO. 35754

Flint, L. R. and W. J. Howarth

THE COLLISION EFFICIENCY OF SMALL PARTICLES WITH SPHERICAL AIR BUBBLES. *Chem. Eng. Sci., vol. 26:1155-1168, 1971. 14 refs.*

In a floatation machine, solid particles are separated from a slurry by colliding with air bubbles and adhering to them. To permit the rational design of a floatation machine, it is important that the rates of collision and adhesion can be predicted. Trajectories were calculated for particles in the path of a spherical bubble arising in an infinite pool of liquid. From grazing trajectories, collision efficiencies were calculated corresponding to values of a particle inertia parameter K down to 0.001 and a particle gravity parameter G up to 0.3 for both Stokes and potential flow fields around the bubble. Limiting values of collision efficiency were derived and shown to be the same for both potential and Stokes solutions. The solution of the equations of motions were verified experimentally, and the existence of an optimum bubble size for recovering an ore particle by floatation was demonstrated. A simplified description of a bubble assemblage demonstrated that the collision efficiency of particles with bubbles in a swarm can be several times as large as those calculated from a single sphere model even at large bubble separations. (Author abstract modified)

17231 APTIC NO. 35408

Flyger, Hans

TRACER EXPERIMENTS FOR THE VALUATION OF THE PARTICLE-FILTRATION EFFICIENCY OF INSTALLED ABSOLUTE FILTERS. *Danish Atomic Energy Commission, Riso, Health Physics Dept. Riso Rept. 66, 12p., July 1963. 7 refs.*

The necessity of controlling the efficiency of installed absolute filters and the importance of a correct choice of prefilters to lighten the load of dust are demonstrated by two examples. A particle cloud of sodium chloride labelled with radioactive sodium-24 was used for the investigations. The composition of the test cloud was determined and compared with that of the methylene-blue standard cloud. A comparison was made between the efficiencies of highly efficient glass-paper filters as measured by the DOP test and the test cloud used. (Author abstract)

17232 APTIC NO. 35315

Freiday, Jay H., West Hartford, and George J. Prohazka

CHEMICAL RECOVERY FURNACE WITH AIR CASCADE EVAPORATORY SYSTEM. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,592,610. 6p., July 13, 1971. 3 refs. (Appl. Dec. 27, 1967, 6 claims).*

Chemical recovery systems are used generally in the paper making industry to process and recover the chemicals used in digesting wood or other cellulose material. In a chemical recovery furnace system including a rotary regenerative air heater and an air cascade evaporator, the location of the forced draft fan can be changed from the upstream air inlet side of the air heater to the outlet side of the air stream through the air heater. By relocating the forced draft fan, the absolute pressure through the air side of the system is reduced, thus resulting in a reduction of the differential pressure between the air and gas sides of the rotary regenerative air heater, and a corresponding reduction in the air-to-gas leakage. Relocation of the fan also enables a closed recirculating heat transfer loop to be formed between the recovery furnace and the cascade evaporator through the fan. This feature has great value in effecting safe emergency shutdown when water is believed to be entering the furnace, thus avoiding the possibility of smelt-water reaction explosion.

17233 APTIC NO. 35717

Frevel, Ludo K. and Leonard K. Kressley

METHOD OF REMOVING SULFUR DIOXIDE AND PARTICULATE MATTER FROM GASEOUS STREAMS. *(Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,589,863. 3p., June 29, 1971. 2 refs. (Appl. March 8, 1968, 11 claims).*

Most existing or proposed methods for the removal of acid gases and particulates from stack or flue gases are cumbersome and expensive, and involve multiple steps. Moreover, the processes do not provide for the simultaneous removal of both acid gas and particulate matter. Typical of these methods are the limestone scrubbing, manganese dioxide, and vanadium pentoxide processes for sulfur dioxide removal. Highly efficient removal of SO2 and/or particulates is achieved, and useful by-products obtained, by passing the gas stream through a bed of porous alkali metal bicarbonate aggregates at 50-130 C. The bed can be a fixed system or a countercurrently moving, replensished system. The porous aggregates attract the particulate matter to their surfaces and thus remove them from the stream, while the sulfur dioxide and other acid gases are simultaneously reacted within or around the aggregates to form solids which leave the gas stream. With this method, the final concentration of SO2, sulfur trioxide, hydrogen bromide, hydrogen chloride, or hydrogen sulfide is often less than 10 to 20 ppm. Similar, more than 90% of any particulate matter is usually removed. The preferred alkali metal is sodium bicarbonate, although lithium, potassium, rubidium, and cesium bicarbonate can be employed.

17234 APTIC NO. 35659

Fumich, George

COAL RESEARCH FOCUSES ON NEW TECHNIQUE. *Elec. World, 168(20): 101-103, Nov. 13, 1967.*

The Office of Coal Research concerns itself with expanding the competitive range of coal, both for energy and nonenergy applications. Tests indicate that the fluidized bed combustion system represents the potential of substantial reduction in initial and operating costs of large utility boilers. It may be possible to reduce to less than one-quarter the overall size now required by a conventional pulverized coal-fired unit. The fluid bed concept appears to be adaptable to sulfur and nitrogen oxide reduction. Among the favorable features are operation with low excess air, relatively low bed temperature, highly stirred environment in the bed, high fly ash density in dilute phase suspension above the bed, the possibility of continuous calcining of a sulfur scavenging agent in the bed such as dolomite, and comparatively high bed residence time of a dolomite or other sulfur combining or absorbing particle. The development of a coal-energized fuel cell is expected to offer additional benefits in the reduction of air pollution and elimination of the requirement for large quantities of cooling water.

17235 APTIC NO. 35736

Garrod, D. J.

A SURVEY OF MEASUREMENT AND CONTROL OF POLLUTANTS. *Meas. Contr., 4(10):253-262, Oct. 1971. (Presented at the Institute of Measurement and Control, Symposium on Measurement and Control, Maidstone, England, April 28-29, 1971.)*

Following a brief outline of the history of pollution abatement in the United Kingdom, a survey is presented of the present state of the art with regard to the measurement and automatic control of pollutants. Present day concerns, costs of pollution control, and the need for legislation are mentioned. Sources of pollutants and control techniques are indicated for particulate matter, carbon dioxide, sulfur dioxide, and other gaseous emissions. Water pollution, solid wastes, noise pollution, and radioactive pollution are mentioned. Certain pesticides, fertilizers, and manure may run off from farmland and cause water pollution. Measurement methods include Ringelmann chart, colorimetry, chemical methods, spectrometry, chromatography, and photometry. Control techniques include electrostatic precipitators, scrubbers, cyclones, afterburners, air-fuel ratio, and combustion control.

17236 APTIC NO. 35092

Geny, P.

ACTION IN THE IRON AND STEEL INDUSTRY. *(Action dans l industrie siderurgique). Text in French. Pollut. Atmos. (Paris), vol. 13:32-37, Oct. 1971.*

Pollutants emitted by the iron and steel industry are dusts of particle sizes between 10 and 100 micron, fine dust, predominantly in the form of red iron oxide fumes, and sulfur dioxide from the fuel or from the minerals, coal, coke, blast furnaces, converters, electric ovens, rolling mills, sheet metal coating installations, coke ovens, and auxiliary installations. Pollutants emitted by blast furnaces can be controlled up to 90% by cyclones, wet dust arresters, venturi scrubbers, or electrostatic filters; those emitted by agglomeration can be controlled up to 95% by cyclones and electrostatic filters in combination with cyclones; pollutants emitted by Martin furnaces without oxygen can be controlled by electric separators, venturi scrubbers, and bag filters up to 99%, and with oxygen by electric separators and venturi scrubbers up to 98%. For Bessemer converters, there is no practical pollution control equipment. Pollution from electric furnaces can be controlled up to 99% by scrubbers, electrostatic separators, and bag filters. Pollution from basic-lined oxygen furnaces can be controlled by venturi scrubbers and electrostatic separators by 99%. Not enough data are available on coke oven pollution control. The investment in pollution control equipment in the French iron and steel industry comes to 10% of the total plant investment, yearly operating costs of the equipment come to 10-15% of its cost. These costs do no always result in satisfactory pollution control.

17237 APTIC NO. 35689

Gerber, A. F. and R. G. Smith, Jr.

SOME EFFECTS OF EXHAUST GAS RECIRCULATION UPON AUTOMOTIVE ENGINE INTAKE SYSTEM DEPOSITS AND CRANKCASE LUBRICANT PERFORMANCE. *Preprint, Society of Automotive Engineers, Inc., New York, 6p., 1971. 4 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich. Jan. 11-15, 1971, Paper 71042.)*

Control of nitrogen oxides in automobile exhaust is scheduled for 1971 in California and is proposed as a national standard for 1973. Because of the potential of exhaust gas recirculation (EGR) for lowering these emissions, the method was evaluated for its effects on intake system cleanliness (formation of deposits in carburetor, intake manifold and ports, and intake tulip valves) and crankcase lubricant performance (low-temperature deposition and high-temperature oxidation and copper-lead bearing corrosion). Nitrogen oxide emissions were reduced approximately 65% by EGR at the eight percent rate. However, EGR caused a rapid accumulation of heavy deposits in the carburetor air intake and increased intake valve and intake manifold deposits. Low-temperature sludge deposition increased with increased EGR rate, being approximately 20% more severe with 10% EGR. Ten percent EGR had no significant effect on copper/lead bearing corrosion but reduced the severity of high-temperature oil oxidation approximately 13%. It also reduced compression ring sticking in low-temperature operation.

17238 APTIC NO. 35705

Gex, Virgil E.

REMEDIAL MEASURES IN AIR POLLUTION WHICH HAVE BEEN TAKEN BY AN INDUSTRY, INCLUDING A DISCUSSION OF COSTS. *Am. J. Public Health, 45(5-1):622-626, May 1955. 3 refs. (Presented at the American Public Health Association, Engineering Section, Annual Meeting, 82nd, Buffalo, N. Y., Oct. 14, 1954.)*

Laboratory work and developments in the field of odor measurement and control, methods of control used in factories, and some of the costs involved in capital investment and operating expense were discussed. A quantitative concept of odor, which measures odor directly without regard to the material that produces, it was developed. An odor unit was established as the amount of odor, regardless of origin, necessary to contaminate one cubic foot of air to the odor threshold or the barely detectable level. Using this definition of an odor unit, the odor concentration can be measured directly by conventional threshold dilution techniques. An odor measuring device was developed which consists of a continuous flow of 10-20 cfm of odor-free reference air into which increasing amounts of odorous sample are introduced, until odor is detected in the exit mixture. The ratio of total diluted flow rate to sample flow rate at the threshold point is measured and is the odor concentration of the sample in odor units/cu ft. Reduction of pollution discharge by changed operating techniques is attractive because it involves little or no investment. Spray condensers, enclosed vent systems, packed scrubbers, venturi scrubbers, odor furnaces, activated carbon filters, centrifugal separators, and air filters were briefly described. Another general category of pollution control is the use of stacks for odor dispersal.

17239 APTIC NO. 35975

Gornisiewicz, Stefan

COMPUTATION OF GAS FLOW RATES THROUGH A FILTER TISSUE TAKING INTO ACCOUNT THE BLOWER AND TRANSMISSION PARAMETERS. *(Berechnung der Gasanstroemgeschwindigkeit eines Gewebefilters unter Beruecksichtigung der Kennlinien von Geblaese und Leitungssystem). Text in German. Staub, Reinhaltung Luft, 31(11):433-436, Nov. 1971. 2 refs.*

Laboratory investigations were carried out on a system comprising a blower, pipe line, and filter. The relation between flow velocity of the filter and filtering time was determined on the basis of the test results and of characteristic curve parameters of the system. In addition, the conditions are given under which self-adjustment of such an installation is possible. Average flow velocity is calculated for a cloth filter. (Author summary modified)

17240 APTIC NO. 35733

Goulet, Roger T. and Ernest Zednik

FILTER. *(Cambridge Filter Corp., Syracuse, N. Y.) U. S. Pat. 3,581,479. 5p., June 1, 1971. 12 refs. (Appl. April 8, 1968, 5 claims).*

When pleated high-efficiency filters are mounted in a supporting frame, pleat edges and both ends of the filter must be continuously sealed to the frame to avoid bypass. The sealing is a time-consuming process involving coating the edges and inside frame surfaces prior to assembly and allowing the sealant to harden after assembling the filter core in the frame. An improved method of applying sealant comprises injecting the sealant into the center of the frame so that it flows outward to both side edges. Specifically, the upper and lower edges of the frame are provided with long grooves in which tubes of liquid sealant are placed. When the tubes are withdrawn, the sealant is discharged to form an embedding slab bonded to the frame on hardening. The sealant can be a mixture of liquid resin and hardener consisting of plasticizer and amide.

17241 APTIC NO. 35499

Gourdine, Meredith C., Geza Von Voros, and Ta Kuan Chiang

TURBULENCE INDUCING ELECTROGASDYNAMIC PRECIPITATOR. *(Gourdine Systems, Inc., Livingston, N. J.) U. S. Pat. 3,581,468. 8p., June 1, 1971. 8 refs. (Appl. April 9, 1969, 20 claims).*

An apparatus is described for more efficiently precipitating particles of diverse sizes by electrostatically generating turbulence in the gas stream and by collecting the particles on a moving collection surface. A moving dielectric surface member is heavily charged electrostatically, with the electrostatic charge being retained on the dielectric member by a strong electric field terminating on an electrode adjacent to the dielectric member but located externally of the gas stream. Particles entrained in the gas stream entering the precipitator are charged electrically to a polarity opposite to the charged polarity of the dielectric member. Charging of the particles is accomplished preferably in a corona discharge having a substantial component in opposition to the gas flow to generate controlled turbulence in the stream. The charged surface of the dielectric member, together with the space charge in the flow, establishes an extremely strong electric field normal to the moving surface to react with the charged particles and move them into contact with the moving surface. The electric field between the charged surface and the exterior electrode has a value exceeding that of the electric precipitation field, thereby preventing dislodgement of the charges and collected particles from the moving surface.

17242 APTIC NO. 35352

Grantham, L. F. and S. J. Yosim

REMOVAL OF LEAD FROM GASES WITH MOLTEN ALKALI METAL CARBONATES. *Am. Chem. Soc., Div. Petrol. Chem., Preprints, 16(2):E88-E99, March/April 1971.*

Laboratory experiments to remove lead-containing vapors and particulates from automobile exhaust gases using molten alkali metals (lithium, sodium, and potassium) are examined. Techniques whereby the gas was impinged on the molten salt surface and contacted on a mesh scrubber wetted with molten salt were used to test lead removal. Apparatus, test procedure, particulate size, and experimental results are discussed. Lead removal efficiency by impingement of the gas containing lead halides increased as impingement velocity increased, with gas temperature, flow rate, residence time, and lead concentration as effective parameters. The percent of lead particulates remaining in the gas phase increased as the gas velocity through the mesh increased but decreased as gas residence time in the wetted wash increased.

17243 APTIC NO. 35884

Grimm, Hugo and Karl-Heinz Doerr

DEVICE FOR THE TREATMENT OF GASEOUS MEDIA. *(Vorrichtung zur Behandlung gasfoermiger Medien). Text in German. Metallgesellschaft A. G., Frankfurt (West Germany)) Swiss Pat. 498,647. 8p., Nov. 15, 1970. (Appl. Jan. 13, 1969, 1 claim).*

The installation described is designed for the drying, purification, and elution of gases by liquids, and specifically for the absorption of sulfur trioxide from gases from contact catalysis; for gas desulfurization; and for the manufacture of oleum. It consists of a vertical Venturi tube with a gas inlet on the side of the upper part and on outlet on the side of the lower part above the bottom. The washing liquid is injected through the top and accumulates in a bath at the bottom of the tube. The Venturi tube is connected by an outlet above the bottom with a housing containing one or more horizontal gas-permeable plates through which the gas must pass in its upward flow. The plates are filled with a layer of the liquid medium pumped from the bath at the bottom of the Venturi tube and kept in simmering motion by the gas permeating the plates. Each plate has a separate drain so that several different concentrations of sulfuric acid can be produced on the various superimposed plates. The gas leaves thye housing through a drip catcher of fine-mesh netting after having passed the uppermost plate. Both the Venturi tube and the housing are lined with ceramic tile.

17244 APTIC NO. 35503

Grosick, Herbert A.

SYSTEM FOR THE REMOVAL OF NAPHTHALENE FROM COKE OVEN GAS. *(Koppers Co., Inc. Pittsburgh, Pa.) U. S. Pat. 3,581,472. 5p., June 1, 1971. 2 refs. (Appl. Aug. 8, 1969, 10 claims).*

In the past, residual naphthalene has been removed during the final cooling of the coke oven gas by precipitating as crystals. However, this can cause clogging and does not completely remove naphthalene vapor. Therefore, on improved process was developed for the removal of naphthalene from coke oven gas. Coke oven gases are cooled in a primary cooler to about 100 F to condense a light oil fraction (primary cooler tar) from the gas. The condensed tar is collected and withdrawn from the primary cooler; the naphthalene is stripped from the tar and is scrubbed from the cooled gas with the primary cooler tar. (Author abstract modified)

17245 APTIC NO. 35104

Haas-Volkmann, Eduard

DEVICE FOR DETOXIFICATION OF EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES. *(Einrichtung zur Entgiftung des Abgases von Brennkraftmotoren). Text in German. (Assignee not given.) Swiss Pat. 503,893. 2p., Feb. 18, 1971. (Appl. Nov. 22, 1969, 1 claim).*

A device for the secondary combustion of exhaust gases from internal combustion engines is described. The air vents through which outside air is drawn into the preheating chamber are covered by a hood which makes possible a lateral position of the vents, thus avoiding a head-on airstream impact. The hood simultaneously serves as a silencer. Another modification separates the combustion chamber from the mixing chamber. The perforated flame keeper is modified to an open-ended funnel welded into the tubular combustion chamber wall. This provides for intensified secondary combustion.

17246 APTIC NO. 35510

Haas-Volkmann, Eduard

METHOD AND DEVICE FOR SECONDARY COMBUSTION OF EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES. *(Verfahren und Einrichtung zur Nachverbrennung der Auspuffgase von Verbrennungsmotoren). Text in German. (Assignee not given.) Swiss Pat. 498,287. 3p., Oct. 31, 1970. (Appl. April 15, 1969, 2 claims).*

The addition of preheated air to the exhaust gases and its subsequent secondary combustion can reduce emissions. This is accomplished by an air preheating chamber enclosing an expansion chamber whose walls act as the heating element for the preheating chamber. Hot exhaust gases flow into the expansion chamber where they flow through a booster nozzle and a mixing nozzle into a mixing chamber. Then they are mixed with the preheated air drawn into the mixing chamber from the preheating chamber by the mixing nozzle. The gas mix undergoes secondary combustion by ignition elements in a combustion chamber adjoining the mixing chamber. The booster nozzle and the mixing nozzle create a mild vacuum in the preheating chamber, which draws in fresh air through adjustable vents. The continuity of combustion is maintained by a perforated or slotted flame keeper installed in the combustion chamber. A sieve is placed between the expansion chamber and the exhaust gas feed pipe.

17247 APTIC NO. 35709

Haigh, D. H. and R. H. Hall

EXPANSIVE IMBIBITION FOR PRACTICAL POLLUTION PARTICULATION, OR, SEPARATING THINGS FROM STUFF. *Preprint, Society of Automotive Engineers, Inc., New York and The American Chemical Society, Washington, D. C., 3p., 1970. (Presented at the Society of Automotive Engineers, and the American Chemical Society, Joint Meeting, Midland, Mich., Oct. 24, 1970, Paper 710654.)*

Imbibitive polymers can be utilized for oil-slick cleanup, for cleaning contaminated mercury containers, and for removing organic vapors from gas streams. For vapor absorption determinations, a hypodermic syringe with a glass wool plug near the middle is loaded with imbibitive polymer to the 0.5 ml graduation. Atop this is placed 0.1 ml of fine silica sand. A control is also prepared in which the entire bed of particles in the syringe is composed of sand with nearly the same surface areas as the polymer. In operation, 0.3 microliter of the liquid organic to be tested is placed on the sand layer in such a way that there is no contact between liquid and polymer. The plunger is then reinserted and the syringe and contents are allowed to equilibrate for five minutes. The gas is then exhausted through the bed into the injection port of a gas chromatograph and analyzed. The decrease in organic is expressed as percent reduction and is arrived at by comparison of the amount of organic remaining in the air after passing through the polymer particles with the amount remaining after passing through 0zand. Reductions obtained for 10 organic vapors are shown.

17248 APTIC NO. 35300

Hamblin, Robert Jeremy John, Frank Vernon Purse, and
William Mathias Sheffer

I-C ENGINE EXHAUST GAS AFTERBURNER AIR CONTROL. *(Vorrichtung zur Regelung der Zusatzluftzufuhr an einer Nachbrenneinrichtung fuer die Abgase von Brennkraftmaschinen). Text in German. (Universal Oil Products Co., Des Plaines, Ill.) W. Ger. Pat. DAS 1,476,622. 6p., Sept. 2, 1971. 10 refs. (Appl. Feb. 26, 1966, 6 claims).*

An internal combustion engine exhaust gas afterburner is provided with a throttle in the air duct, loaded by a spring which acts against the air stream in the direction of the opening, in order to effect air control. A permanently open bypass, which extends through the piston in the duct end of the throttle and into the dust, is included.

17249 APTIC NO. 35519

Hardison, Leslie C.

GAS-LIQUID SCRUBBING TOWER. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,585-786. 5p., June 22, 1971. 4 refs. (Appl. Aug. 12, 1968, 4 claims).*

Mass transfer between a liquid and a gas is employed to clean the gas of entrained solids, absorb the gas in the liquid, or react the gas with the liquid. Conventional scrubbers effect mass transfer by bubbling gas through a liquid or by spraying a rising gas stream with a liquid. The former method provides insufficient gas-liquid contact and causes undesirable frothing between liquids and gases. The frothing results in clogged gas inlets and sometimes clogged liquid inlets and gas outlets. The second method provides adequate gas-liquid contact but further increases the frothing. A scrubbing tower with vertically mounted tubes effects mass transfer without creating the turbulence that causes frothing. The upper portion of the tubes, which extend through a partition dividing the upper and lower sections of the tower, is surrounded by a liquid. The liquid flows as a laminar film down the inner walls of the tubes and is contacted by the gas stream rising in the center of the tubes. Applications of the scrubber include oxidizing waste sulfide liquor in paper production, fly ash removal, and extracting nitrogen oxides from tail gas produced by nitric oxide production.

17250 APTIC NO. 35525

Hart, Wilbur E.

APPARATUS FOR IGNITING AND BURNING AIRBORNE PARTICULATE COMBUSTIBILE MATERIAL. *(Bank of California, San Francisco) U. S. Pat. 3,589,315. 5p., June 29, 1971. 4 refs. (Appl. Sept. 11, 1969, 2 claims).*

A need exists for apparatus for igniting and burning particulate solid materials, either as part of a waste disposal system or as means of producing heat from such burning. A burner chamber is described that produces complete ignition and preliminary burning of particulates. A duct equipped with a blower introduces the combustible material into the chamber and initiates a circumferential swirling movement of the material and air in the chamber. A constricted throat section adjacent to the discharge end of the chamber restricts the flow of material from the chamber, thus increasing the residence time of particulates. This is effective in increasing the temperature of the chamber and in promoting ignition and burning of material difficult to process at a lower temperature. Additional air introduced adjacent to the throat section imparts further circumferential whirling movement that completes the movement produced in the combustible material on its entry in the chamber. The additional air also promotes the residence time of the material and provides the extra oxygen need for further burning of already ignited material.

17251 APTIC NO. 35768

Hayakawa, Toichi

THE EFFECT OF THE TEMPERATURE OF WATER COOLED GASOLINE ENGINE ON THE AMOUNT OF CO IN EXHAUST GAS. *(Suirei gasorin enjin no aidoringu untenji ni okeru reikyaku suion ga haishutsu gasu chu no CO no hoshutsuryo ni oyobosu eikyo ni tsuite). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Hokkaido Branch, p. 279-282, 1971. 2 refs. (Presented at the Japan Society of Mechanical Engineers, Hokkaido Branch Lecture Meeting, 15th, Sapporo, Japan, Oct. 31, 1971.)*

The effects of the temperature of the cooling water on the carbon monoxide content in automobile exhaust gas were examined during the idling operation. A 358 cc automobile with a four cycle four cylinder gasoline engine with a compression ratio of 10 and a maximum power of 20 PS/7000 rpm was used for the experiment. The temperature of the cooling water was maintained at the entrance by an adjustment tank. The temperature difference between the entrance and the exit was kept to four degrees by a pump installed outside the engine, which maintained the flow speed in the jacket as well. Operating variables caused by the change of cooling water temperature were examined on the engine capacity and exhaust gas. Maintaining the cooling water temperature at low during the idling operation decreased friction loss and cooling loss and increased the thermal effect rate. Therefore, in order to control idling rotation speed, the valve had to be closed. This meant a reduction in the amount of the exhaust gas, but the air-fuel ratio was overly rich and therefore the amount of carbon monoxide emission increased. The temperature of the cooling water of an engine should be kept rather low from the standpoint of controlling CO emission. Operating variables and results are presented by graphs.

17252 APTIC NO. 35201

Heinen, C. M.

WHERE ARE ALL THOSE GADGETS GOING? Preprint, Society of Automotive Engineers, Inc., New York, llp., 1971. 15 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Paper 710074.)

With the passage of the Clean Air Act, the automobile industry has a clear assignment to reduce automobile emissions drastically by 1975. Presently available control devices have already reduced hydrocarbons 83%, carbon monoxide 70%, and nitrogen oxides 33%. By 1975, these figures must be 98%, 97%, and 90%, respectively. Engine modifications do not have much chance of meeting the 1975 standards without a great deal of supplementation. Manifold reactors and calalysts present more promising approaches, provided high-temperature materials are developed. Flame reactors must operate between 1200-200 F and catalysts between 600-1400 F. Evaporative and crankcase controls will also have to be used with manifold reactors. Other engine changes include retarded spark timing, improved carburetion, reducing the compression ratio, and adding secondary air with the manifold.

17253 APTIC NO. 35530

Helbig, Bertram

DEVICE FOR THE SEPARATION OF SMALL DROPLETS, ESPECIALLY OF OIL FROM GASES AND VAPORS. *(Vorrichtung zum Abscheiden von feinen Fluessigkeitsteilchen, insbesondere von Oel aus Gasen oder Daempfen). Text in German. (VEB Stroemungsmaschinen, Pirna (East Germany)) Swiss Pat. 503,510. 3p., Feb. 28, 1971. (Appl. Dec. 3, 1969, 1 claim).*

The described invention separates finely dispersed oil mist from gases in a separation chamber in a way causing only a very small loss of pressure. The separation chamber is a box in which a deflection plate faces the gas inlet. The sides of the box consist of filter pads of synthetic fibers. For gases with a substantial content of the liquid phase it is advantageous to insert a filter pad also between the inlet and the deflection plate which thus forms a preliminary filter. Such a device works well connected for example to an encapsulated machine tool with a propeller blower between the machine tool and the separator providing the necessary pressure of 20-30 kp/sq m. The filter pads are removable, the deflection plate forms a hinged cover.

17254 APTIC NO. 35476

Henson, C. G.

POLLUTION FROM BOILER STACKS AND ENGINE EXHAUSTS - THE CHEMISTRY OF AIR POLLUTION AND ITS SOLUTION BY THE PROFIT FACTOR. *Clean Air, 1(3):22-28, Autumn 1971. 9 refs.*

Pollutant emissions from boiler stacks and engine exhausts are examined with respect to chemical interactions, effects on materials, emission levels, control measures, fuel additives, and effects on human health. Gaseous products of combustion from boiler stacks or engine exhausts include carbon dioxide, carbon monoxide, smoke, sulfur oxides, sulfuric acid, nitrogen oxides, unburned hydrocarbons, acid smut, particulates, and fly ash. The use of lead as an anti-knock agent in petrol engines also contributes to noxious emissions. Remedial measures consider such factors as combustion engineering, operating variables (excess air supply), electrostatic precipitators, scrubbers, filters, and fuel content. Fuel additives such as manganese can also reduce smoke and other emissions.

17255 APTIC NO. 35048

Hirabayashi, Teruhiko and Yoichi Shimoi

INCINERATION OF RHODANIDE SALT. *(Rodan enbunkai sochi ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(11):89-91, Nov. 1971.*

The method of eliminating hydrogen sulfide from toxic gas using naphtoquinon(?) sulphon acid soda, which is currently used by many Japanese gas companies, has many advantages over previously used methods. However, when hydrogen cyanide coexists with H2S in the gas, rhodanide salt (NaSCN or NH4SCN) is created at the time of the absorbent recovery. The NaSCN does not absorb H2S, cannot be recovered, and will accumulate. It will decrease the concentration of sodium carbonate, which will have to be replaced from time to time. A method of incineration of the toxic rhodanide salt is discussed. It can be utilized for incineration of waste liquids containing other inorganic salts. The main part is a liquid combustion system using a thermal high speed burner. Concentrated NaSCN containing waste liquid is sprayed in an aerosol form into the combustion room. Fuel is jet sprayed from another nozzle, and the combustion room is kept at 700-900 C. The air can be turned to an acidic or reducing condition as required. In an acidic atmosphere, sodium and sulfur automatically turn into sodium sulfate, which can be disposed of easily. Experimental results have proven that 100% of NaSCN was decomposed by this method. There is almost no danger of accumulation of sodium sulfate in the system; most of the H2S is absorbed during the incineration, and what is left can be absorbed in an additional absorption process where the naphtoquinon sulphon acid soda may be used. An afterburner will eliminate incompletely burned carbon monoxide and hydrogen.

17256 APTIC NO. 35917

Hirayama, Kenichi

AIR CLEANING APPARATUS. *(Kuki seijo sochi). Text in Japanese. (Mitsubishi Electric Appliances Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 46-31354. 2p., Oct. 29, 1971. (Appl. Jan. 28, 1969, 1 claim).*

In the structure of a simple air cleaner with a zigzag-type rolling filter, a pair of chains moving the filter material are often clogged or worn out by accumulation of dusts. In order to avoid such damage, dust cleaning devices are installed. Dust accumulations on the chain and between pins and chain plates are eliminated completely.

17257 APTIC NO. 35932

Hirayama, Kenichi

AIR CLEANER. *(Kuki seijoki). Text in Japanese. (Mitsubishi Electric Appliances Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 46-31351. 2p., Oct. 29, 1971. (Appl. Dec. 29, 1968. 1 claim).*

The roll-type or the zigzag-type air filter material has a square ending and the insertion of a new filter roll into an air cleaner is extremely difficult. This invention consists of cutting the end of the filter material in a triangular shape or semicircular, crescent shape so that the end of a new filter roll would catch between the guiding roller smoothly, without manual help.

17258 APTIC NO. 35544

Holcombe, J. K. and P. W. Kalika

THE EFFECTS OF AIR CONDITIONING COMPONENTS ON POLLUTION IN INTAKE AIR. *ASHRAE (Am. Soc. Heat. Refrig. Air-Cond. Eng.) Proc., vol. 77:33-49, 1971. 33 refs.*

In recognition of the problems that air pollutants may cause, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, through its Task Group on Air Pollution, sponsored a study to determine the extent to which air conditioning equipment could remove pollutants from conditioned air supplied to interior spaces. Substantial air pollutant removal efficiency information is available for filters, electrostatic precipitators, and activated charcoal components. For other components such as air washers/scrubbers, only scattered and largely inadequate information is available at the present time, particularly for gaseous pollutants. Information on indoor/outdoor air pollutant relationships was reported from only a handful of research programs. Information on the relationship of indoor pollutant concentrations to indoor activities, numbers of occupants, and types and configurations of furnishings is virtually non-existent. Based on limited measurements in air conditioned office buildings, internal generation of suspended and soiling particulate matter is a significant parameter in estimating indoor concentrations of these pollutants. The use of a generalized theoretical approach for predicting indoor/outdoor air pollutant relationships appears to be a potentially value technique. (Author conclusions modified)

17259 APTIC NO. 35142

Holmer, Heinz Ernst Axel

DEVICE FOR THE REDUCTION OF WHITE EXHAUST GASES FOLLOWING A COLD START AND FOR THE IMPROVEMENT OF HEAT STORAGE CHARACTERISTICS IN INTERNAL COMBUSTION ENGINES. *(Vorrichtung zur Verminderung weisser Auspuffgase nach dem Kaltsart und zur Verbesserung der Waermespeicherfaehigkeit von Brennkraftmaschinen). Text in German. (Aktiebolaget Volvo, Gotenburg (Sweden)) Swiss Pat. 496,888. 4p., Sept. 30, 1970. (Appl. July 4, 1969, 1 claim).*

Invisible exhaust gases following ignition, a short engine heating period, and normal cooling water temperature even during idling can be achieved by the installation of a pressure regulating device in the exhaust pipe. As a result, intake air is mixed and heated with the hot exhaust gases which flow back into the engine. Oxygen concentration drops, but never below a level that would prevent complete combustion of the injected fuel in the cylinders. The limit of permissible counterpressure depends on the resistence of the exhaust valve springs, because the valves must not be opened by the counterpressure. Such opening would interfere with the run of the engine and again produce white exhaust gases. The counterpressure in the exhaust pipe imposes a certain load on the engine even though it delivers no work. This increases fuel consumption and the temperature of combustion chamber walls, of engine cooling water, and of the car interior. To achieve constant counterpressure, a disc valve is pressed against a valve seat by a compressed air activated piston or bellow. A valve preset by a spring can likewise be used.

17260 APTIC NO. 35955

Howorth, Frederic Hugh

APPARATUS FOR FILTERING POLLUTED AIR. *(Appareil pour filtrer de l air pollue). Text in French. (Howorth (James) and Co. Ltd, Bolton (England)) Swiss Pat. 503,511. 3p., April 15, 1971. (Appl. Sept. 10, 1968, 5 claims).*

An apparatus is described for removing impurities such as dust, sludge, and oily or tarry particles from polluted air drawn either from working premises or from the open atmosphere, and projected through a conduit. Inside the conduit, two sheet filters made of porous plastic material and supported by frames are mounted in parallel a short distance from each other at an angle of 45 deg to the center line of the conduit. As the air flows through, the particles are trapped by the first filter, and are washed down by a water spray from a perforated tube located ahead of the filter. The polluted spray water is collected in a receiving tank attached to the underside of the conduit. From there the liquid flows by gravity into a sump tank which comprises two compartments, separated from each other by an overflow partition wall. The first compartment provides for settling and sedimentation, and is designed to permit periodic removal of the sludge and replacement with clean water. The second compartment receives the clear overflow water, to which a deodorizing detergent solution is added; the detergent is selected depending on the source of the polluted air. The cleaned water is returned to the spray system and thus re-used in a closed cycle. The air that has passed through the first filter carries a substantial amount of humidity which forms into droplets on contact with the second filter in the conduit; the droplets fall back onto the first filter and are thus returned to the water collecting system. After passing through the second filter, the air is only slightly more humid than it was on entering the apparatus.

17261 APTIC NO. 35529

Hungate, Ernest Cornell

DEVICE FOR THE SEPARATION OF DROPLETS FROM A FLOW OF GAS. *(Vorrichtung zum Abscheiden von Fluessigkeitspartikeln aus einem Gasstrom). Text in Ger-*

man. (Assignee not given.) Swiss Pat. 503,509. 6p., Feb. 28, 1971. (Appl. July 14, 1969, 1 claim).

The device separates droplets from a flow of gas in a duct by the impact of the gas against a number of appropriately positioned wall parts and does so even at gas flow velocities at which other systems, based on the same principle, no longer separate the liquid phase; the gas issuing from this drip catcher is practically free of liquid. The device is designed to be used in conjunction with conventional industrial scrubbers. The drip catcher consists of a number of parallel vertical wall parts arranged in a zigzag manner. Vertical troughs in the walls collect the separated liquid which flows downward and along a slanted bottom into a drainage system. The multiple impact and change of direction of the gas flow induced by the zigzag construction of the channels, as well as the interaction between the gas flow and the flow of the separated liquid phase, result in a high separation efficiency of the device.

17262 APTIC NO. 35189

Hutchfield, John K. and Peter Simpson

IMPROVEMENTS IN OR RELATING TO HYDROGEN SULPHIDE REMOVAL FROM GASES. *Simon-Carves, Ltd., Stockport (England) Brit. Pat. 1,182, 255. 3p., Feb. 25, 1970. (Appl. April 29, 1966, 9 claims).*

In the method described, gas containing 0-60 ppm hydrogen sulfide is scrubbed with an aerated alkali metal carbonate (solution preferably sodium carbonate). Hydrogen sulfide goes into solution and the resulting hydrogen sulfide ions are oxidized by the dissolved oxygen. The pH of the solution is maintained at not less than 8.5. The solution is aerated with a rotary surface aerator. No hydrogen sulfide ions remain in the solution leaving the scrubber, which is recycled and reaerated before the next scrubbing operation.

17263 APTIC NO. 35930

Hutton, Ray

POLLUTION -- INDUSTRY TAKES THE NOX. *Autocar, 135(3947):20-23, Nov. 25, 1971.*

According to estimated figures for 1968 published by the Department of Health, Education and Welfare, 39% of all air pollution is attributable to motor vehicles. They provide roughly 50% of the man-made hydrocarbons, 60% of all carbon monoxide, and about 40% of the oxides of nitrogen. The motor vehicle is unquestionably the most important contributor to photochemical smog: It started in Los Angeles in the early 1950s, when the theory was advanced that hydrocarbons emitted by the motor vehicle reacted with sunlight and oxides of nitrogen under certain atmospheric conditions, such as those that exist in the Los Angeles basin. California took it upon itself to produce anti-pollution legislation, and in 1961 all new cars sold in the state had to be fitted with crankcase emission control devices. The effect of existing Federal standards has been to reduce hydrocarbons by over 80% and carbon monoxide by about 70% over the uncontrolled car. A standard for oxides of nitrogen of 0.4 gpm is to become effective in 1976 which is where the trouble begins. Hydrocarbons and carbon monoxide are both controlled by oxidation, while nitrogen oxides need to be reduced. The first steps in nitrogen oxide control have brought back the air pump. Fuel mixture, until now run as lean as possible to aid hydrocarbon/carbon monoxide reduction, has been enriched to help the nitrogen oxide situation and the increased hydrocarbons burnt off by air injection at the exhaust ports. The thermal reactor or afterburner and catalysts are also considered for the control of vehicle emissions. Engine design modifications are also being studied.

17264 APTIC NO. 35816

Hyman, M. H. and W. R. Pyle

GASOLINE LEAD ADDITIVES -- A BALANCED VIEWPOINT. *Am. Chem. Soc. Div. of Petrol. Chem., Preprints, 16(2):E107-E112, March 1971. 7 refs. (Presented at the Los Angeles Meeting, March 28-April 2, 1971.)*

Increasing aromatics content with reformate is an economic path to boosting lead-free octanes. However, increased aromatics content can cause fuel sensitivity to be worse. Gasoline blended without lead should contain enough branched-chain paraffins to cancel this effect. Among the environmental benefits of increased reformate manufacturing are less sulfur in gasoline; more hydrogen (a reformate by-product) available for desulfurizing other fuels; more availability of natural gas (otherwise consumed in hydrogen manufacturing); and more availability of high-octane liquefied petroleum gas (another reformated by-product). The main disadvantage is higher crude oil consumption. However, this may be offset by sales of compact cars with high fuel economy. Other benefits of withdrawal of lead additives from gasoline are less atmospheric haze, less corrosion of vital auto parts, and the ability to use a wider variety of control devices.

17265 APTIC NO. 35133

Ibragimov, I. Kh., N. Kh. Valitov, G. M. Panchenkov, and G. I. Sivak

UTILIZATION OF SULFUR DIOXIDE FROM INDUSTRIAL WASTES. *(Utilizatsiya dvuokisi sery iz promyshlennykh vybosov). Text in Russian. Khim. Prom. (Moscow), no. 9:681-684, 1971. 11 refs.*

A catalytic method for the oxidation of sulfur dioxide from industrial waste gases was investigated and a procedure for the conversion of SO2 into ammonium sulfate is described. Laboratory studies included the utilization of several vanadium containing catalysts for the conversion of a 0.3% SO2 containing gas mixture of 95-100% humidity. Temperature dependence, time of catalytic exposure, and oxygen concentration were the studied parameters in terms of their effect on the process. Sulfur trioxide produced by this procedure was converted into sulfuric acid by means of the humidity contained in the gas mixture. Dry ammonium sulfate was obtained following temperature reduction from 460 C to 220 C and by addition of ammonia at a two mole NH3/one mole SO2 ratio. The formed crystals of ammonium sulfate were trapped by a hose filter and the residual gases containing 0.02% SO2 were thrown into the atmosphere. Industrial testing of the procedure was carried out on a pilot plant utilizing SO2 from gases produced by petroleum pyrolysis and a sulfur vanadium silicagel catalyst. The SO2 content of the residual gases was 0.007 to 0.02% and corresponded to a conversion yield of 80 to 94%. No alterations in catalytic activity were observed following 100 hr of testing.

17266 APTIC NO. 35296

Ichijo, Michio

JAPAN TODAY: POLLUTION-FREE METALLURGY. *Mining Mag. (London), 125(5):471-474, Nov. 1971. 10 refs.*

A pollution-free process for recovery of various metals from Kuroko ore is described. The ore is first separated by a flotation process to produce copper, lead, zinc, iron, and slime bulk concentrates, plus tailings. The copper concentrate is then treated by a dry method for extraction of crude copper. Iron concentrate is treated by the Kohwa process to obtain hematite pellets. Lead and zinc dust from the copper concentrate and vaporized copper, lead, and zinc chlorides from the iron concentrate are treated in a gas-absorbing neutralization tank and then separated from the transparent solution by precipitation. Lead and zinc concentrates and slime bulk concentrates are oxidized and leached with ferric chloride solution, separating the precipitate from the transparent solution. Sulfur is precipitated as elemental sulfur, then the leached residue is recycled to the flotation process. The transparent solution, after leaching with ferric chloride, contains copper, lead, zinc, and other metallic ions. High purity metals are obtained by amalgam phase exchange in combination with amalgam electrolysis.

17267 APTIC NO. 35746

Ichikawa, Michio

PROBLEMS IN PLASTIC WASTE INCINERATORS. *(Purasuchikku haikibutsu shokyaku-ro no mondaiten). Text in Japanese. Preprint, Ministry of International Trade and Industry (Japan), Agency of Industrial Sciences and Technology, p.25-35, 1971. 5 refs. (Presented at the Conference of Polymer Studies, 5th, Tokyo, Japan, 1971.)*

Problems in the design and construction of plastic waste incinerators are reviewed. Large capacity for incineration and complete combustion; damage free structure; minimum soot production; toxin-free exhaust smoke; complete treatment of waste liquid; continuous supply; and maximum utilization of created heat are some established criteria. Uses for heat generated by incinerators and the mechanisms of soot and toxic gas production are discussed. Pretreatment methods of polyvinyl chlorides include dry distillation in an oxygen-free kiln at a stable temperature of 280 C; most of hydrogen chloride is discharged and recovered as chlorine. Residue is burned; HCl in the smoke is washed, and the waste liquid is neutralized and discharged. A second process consists of dry-distillation in a rotary furnace of 350 C. After cyanized hydrogen in the gas is completely decomposed in a high temperature liquid, chlorine is recovered in an HCl absorption tower. In another process, the material is submerged into 380 C soluble bath and HCl is discharged. Hydrocarbons are separated from the gas, and chlorine and fuel oil are recovered. Residue is mixed in concrete and disposed. A fourth process, where rough bits of plastic waste are thrown into a reactor with sand flowing layers at stable temperature of 280 C, is still in the process of development. The flowing sand layers keep the temperature distribution stable and dechlorination of the material is continuous.

17268 APTIC NO. 35874

Idel chik, I. E. and V. P. Aleksandrov

CHOICE OF ELECTROSTATIC PRECIPITATOR COMPONENTS IN HIGH CAPACITY UNITS, AND THEIR MODELLING. *Thermal Eng. (English translation from Russian of: Teploenergetika), Jan. 1971. 5 refs.*

A precipitator can be highly efficient from an electrical and design point of view and still suffer from an appreciable increase in ash carryover with the flue gases if the gas entering the precipitator does not do so under the correct flow conditions. The degree of uniformity of the gas flow distribution both over the cross sections of the precipitators and over individual sections depends on the form and parameters of the inlet and outlet sectors. Design criteria are indicated for obtaining the optimal form and parameters of the inlet and outlet sectors and the gas distribution units, based on experiments on the aerodynamics of precipitator models with different flow entry systems.

17269 APTIC NO. 35863

Iinoya, Koichi

TREATMENT OF DUST AND ITS CONTROL MEASURE. *(Funjin shori to sono taisaku). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Western Branch, and Japan Society of Chemical Engineering, Okayama District Branch, p. 26-34, 1971. 6 refs. (Presented at the Japan Society of Chemical Engineering, Environmental Pollution Control Measure Lecture Meeting, Okayama, Nov. 1971.)*

Characteristics of dust, and the method of measurement of particle size, density, water content, gas flow speed, pressure loss, and dust collection rate are given only in an outline. The economic aspects of various collection methods, and the mechanism and capacities of cyclones, bag filters, packed filters, scrubbers, and electrostatic precipitators are presented in tables and diagrams. The relationship between the flow speed of the gas and the collection rate is reviewed by a graph. The rates of collection of electrostatic precipitators and bag filters initially are extremely high and drop drastically, for the former between 0 and 5.0 m/sec, and for the latter between 0 and 12 m/sec. The packed filters maintain the high rate of collection up to 10 m/sec. Cyclones maintain a medium rate of collection with a slight peak between 15 and 20 m/sec. Scrubbers show a medium rate of collection with a slight upward climb between 5.0 and 30 m/sec. The inertial precipitation method starts with an extremely low rate of collection and slightly climbs upward to 25 m/sec and then drops. Various data are quoted from previously published material.

17270 APTIC NO. 36019

Imai, Takao

AIR PURIFICATION BY ACTIVATED CARBON FILTERS. *(Kasseitan firuta ni yoru kuki joka). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(12):1289-1295, Dec. 1971. 12 refs.*

The principal toxic gases in the air of Tokyo, various gaseous material emitted by the human body, the ventilation requirement per person, and the treatment of low concentration gases by activated carbon filters are discussed generally. The performances of various activated carbon filters and the costs of carbon filters are compared by tables, graphs, and diagrams. The performance of two or three activated carbon filters were tested in the air with approximately 0.1 ppm concentration of sulfur dioxide. One type of filter, with a layer of carbon 13 mm thick with the outer frame 610 by 610 by 223 cm, and containing approximately 16 kg carbon, absorbed approximately 75 to 99% of SO2. It also absorbed more than 90% of hydrogen sulfide and approximately 90% of nitrogen oxides and ozones. Higher adsorption rates were noted in higher temperatures with any type of filter. The same activated carbon filters adsorbed 95% of bad odors. This adsorption rate is maintained in temperatures lower than 100 F, under a given air flow rate, until 15% of the weight of activated carbon is adsorbed. The air treatment apparatus using activated carbon, which was specially designed for the National Treasury of Nara, is able to eliminate approximately 100% of SO2.

17271 APTIC NO. 35548

Imamura, Sadao

SMALL INCINERATOR OF THE COMBUSTOR TYPE. *(Conbasutoru kogata shokyakuro ni tsuite). Text in Japanese. Nenryo Oyobi Nensyo (Fuel and Combustion), 38(11):65-70, Nov. 1971.*

A small combustor incinerator designed by an American manufacturer is discussed. The incinerator is designed to be smokeless, odorless, and sootless. The unique egg shape of the combustion room controls the temperature, and the second and third combustion chambers allow complete combustion of solid waste, limiting the emission of odor and smoke to the minimum. By maintaining the temperature in the combustion room at 760 C and that in the stack at 815 C, emission of nitrogen oxides is prevented. Keeping the gas in the stack for 1.5 sec and the slow speed of the gas suppress the emission of soot. Diagrams, illustrations, and capacities according to design specifications are given.

17272 APTIC NO. 35923

Inoguchi, Masao, Kazuhito Tate, Yoshito Kaneko, Yoshihito Satomi, Kiyohiko Inaba, Takehiko Mizutori, Harumi Kagaya, Reijiro Nishiyama, Saburo Onishi, and Tamotsu Nagai

STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT. *Bull. Japan Petrol. Inst., 13(2):147-152, Nov. 1971. 8 refs.*

Pore properties of catalyst supports used in hydrodesulfurization of residual fuel and methods of manufacturing desirable pore sizes were discussed. The correlations between pore properties of gamma-alumina and calcination and preparation of alumina hydrates, especially boehmite gel, were investigated. With higher hydrolysis temperature, the crystallites became larger, the specific surface area decreased, and the pore volume increased. When the aging period of boehmite gel was prolonged, the degree of crystallinity advanced and consequently, the specific surface area and pore volume decreased. When alumina hydrates were washed in water, the pore volume and surface area decreased. When they were washed in alcohol, the volume and surface area increased. As the calcination temperature increased, the surface area decreased and the pore volume increased. The most important effect on the pore structure of the alumina as a catalyst support was the permeation of alcohols into the interstice of crystallites of alumina. During the preparation of alumina hydrates, the diameter of crystallites could be changed, thus controlling the pore structure. When suitable acid was added to alumina hydrates to make alumina supports, the specific surface area was independent of the acid concentration, while the pore volume and diameter decreased with increase of acid concentration.

17273 APTIC NO. 35924

Inoguchi, Masao, Harumi Kagaya, Kanji Daigo, Satoshi Sakurada, Yoshihito Satomi, Kiyohiko Inaba, Kazuhito Tate, Reijiro Nishiyama, Saburo Onishi, and Tamotsu Nagai

STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST. *Bull. Japan Petrol. Inst., 13(2):153-161, Nov. 1971. 4 refs.*

Deposits of carbonaceous materials, vanadium, and nickel form on the surface of catalyst beds or catalyst particles used in long run activity tests during the hydrodesulfurization of residual fuel. In the early stages, the amount of deposits depended on the temperature distribution inside the reactor. Later during the reaction, the amount increased in the lower part of the catalyst bed. After 100 hours, the amount of deposited carbon became constant and no further increase occurred. The amount varied with the kinds of catalysts and the amount of asphaltene in the feed oil. Although vanadium varied with the catalyst, it usually deposited more frequently in the upper part of the catalyst bed. The activation energy of vanadium was about 10 kcal/mol. Nickel also was deposited more in the upper part of the bed, however it spread out more widely on the whole bed. Vanadium deposited thinly but densely on the surface of catalysts with a smaller mean pore diameter; on larger pore diameter catalysts it deposited in a larger amount -- sparsely on the surface, and deeper in the inner part of the catalyst particles. Carbon deposited inside cracks or holes which had been produced during the catalyst's preparation.

17274 APTIC NO. 35095

Inoue, Kiyoshi

DESULFURIZATION PROCESS. *(Datsuryu shorihou). Text in Japanese. (Japax Co.) (Japan)) Japan. Pat. Sho 46-34507. 2p., Oct. 9, 1971. (Appl. July 15, 1968, 1 claim).*

An improvement of the catalytic cracking process for removing sulfur compounds contained in fuel oils such as kerosene, light oil, and heavy oil is discussed. During fixed-bed catalytic desulfurization with the addition of hydrogen to the fuel oil, the catalyst is charged by a pair of electrodes set in a catalyst tower. Thus, its catalytic action is maintained, and consequently catalyst recovery is not necessary as much as for the conventional process. Furthermore the process and the equipment for the desulfurization is very simple.

17275 APTIC NO. 35999

Inoue, Masayuki

DRY DUST COLLECTION PRINCIPLES AND HIGH PRESSURE EXPANSION CLEANING. *Preprint, Dept. of Commerce, Washington, D. C. and the Water Pollution Control Federation, Washington, D. C., 11p., 1971. 5 refs. (Presented at the Technical Conference on New Technology in the Solution of Practical Problems in Air and Water Pollution Control, Tokyo, Japan, Dec. 8, 1971.)*

High-pressure expansion cleaning is a new technique providing the increased cleaning power necessary for bag filter systems handling high-velocity air flows. The method requires one half or less of the compressed air input for cleaning in the jet pulse cleaning method. This means an equivalent reduction in power requirements. A high-pressure expansion filter is provided with two clean air plenums, one above the other, with the lower partitioned to restrict air flow to a specific number of bags. High-pressure air (50-100 psi) released into the lower plenum during the cleaning cycle closes a valve sealing the lower chamber off from the upper chamber. The instaneous expansion of cleaning air in the closed chamber applies energy directly to the bags with minimum loss of cleaning efficiency. The air passes rapidly through the bags from the inside to the outside, releasing the dust cake. The 40-50% increase in velocity of filtered air attainable with high-pressure expansion cleaning reduces equipment and operating costs and provides excellent filtering of particulates considered off limits for fabric filtration.

17276 APTIC NO. 35247

Issler, Joerg

IGNITION AND EXHAUST GAS. *(Zuendung und Abgas). Text in German. Bosch Tech. Ber. (Stuttgart), (1):15-20, Nov. 1969.*

Correct combustion of fuel-air mixtures is required to reduce the amount of harmful components in exhaust from gasoline engines. The degree of combustion depends on spark duration; the dependence is different for different motors, and is more pronounced for a leaner mixture. Exhaust emissions can be reduced by suitable timing in the idling mode and by determination of the dependence on spark duration from engine rpm and load in various operating cycles.

17277 APTIC NO. 35963

Ito, Eiichi

PRESENT STATUS OF DESULFURIZATION FROM FLUE GAS ON THERMAL POWER PLANT FOR THE ELECTRIC UTILITY INDUSTRY. *(Jigyoyo karyoku hatsudensho ni okeru haien datsuryu no shinpojokyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(12):1099-1107, Dec. 1971.*

The activated carbon method and the manganese dioxide method are explained in detail with flowsheets as large scale desulfurization systems used by thermal power plants. The manganese dioxide method uses powdered, activated manganese dioxide as an absorbent, which is mixed in the absorption tower with the exhaust gas. After sulfur dioxide and sulfur trioxide are absorbed, the absorbent is collected by a dust collector. Most of the absorbent is recirculated, but a part of it is sent to the recovery processing where manganese sulfate is changed into activated manganese dioxide and ammonium sulfate. The activated carbon water scrubbing method uses the chemical reaction between activated carbon and SO2. After the adsorption, the activated carbon is scrubbed in water, SO2 is separated, and the carbon is dried and recovered. The activated carbon gas separation method is basically the same as the water scrubbing method. Instead of a packed adsorption tower, this method uses a mobile fluid bed for SO2 adsorption, and the separation is achieved by high temperature inactive gas; SO2 is recovered as sulfuric acid. The wet lime method uses quicklime or lime powder in slurry form as an absorbent and recovers plaster as a byproduct. Various types of desulfurization system under construction in Japan are briefly mentioned.

12278 APTIC No. 35126

Jahnke. Herbert

ELECTRIC DUST TRAP. (Elektroabscheider). Text in German. (Assignee not given.) W. Ger. Pat. 1557031. 7p., Aug. 26, 1971. 12 refs. (Appl. April 19, 1967, 6 claims).

An electric dust trap uses spaced, consecutive electrodes as dust collectors. The collectors are preferably metallized cardboard or conductive plastics. Each collector has at least one side wall inclined with relation to the housing wall which conducts the current. The surface end of the side wall faces the air inlet; the other end is in the free point or in the corresponding working edge of the previous electrode facing the air outlet.

17279 APTIC NO. 35097

Janin, Robert

THE ACTION OF THE ELECTRIC POWER INDUSTRY IN FRANCE. *(Action d Electricite de France). Text in French. Pollut. Atmos. (Paris), vol. 13:16-18, Oct. 1971.*

Coal-fired electric power station have improved their electrostatic dust arresters to an efficiency of 99%. The quantity of dust emitted per kg solid fuel burned is now one eighth of what it was ten years ago. Over the last 15 years, about 20 million dollars have been spent on dust removers not including operating costs. To reduce the emission of sulfur dioxide by coal and by fuel oil electric generating stations, continuous regulation of combustion has been introduced and either ammonia is injected into the air stream before it reaches the furnace, or dolomite is added into the furnace. Thermal power stations achieve a very efficient dispersion of pollutants by building up to 240 m high stacks. Fuel oil or coal with only 0.5% sulfur content instead of two to three percent sulfur content is now used. A system of monitoring atmospheric pollution has been introduced, and under certain weather conditions power plants either reduce or stop operations completely. Currently eight million dollars are spent annually on pollution control by the French electric power industry, and this amount will double in five years. The introduction of nuclear power stations will eliminate all pollution problems and will simultaneously solve the problem of the steadily increasing consumption of electricity. Radioactivity emitted into the atmosphere by nuclear power plants does not exceed that emitted into the atmosphere by conventional electric generating stations in the form of carbon-14.

17280 APTIC NO. 35492

Janoso, R. P.

SYSTEM-WIDE AIR POLLUTION CONTROL. *Power Eng., 75(12):32-35, Dec. 1971.*

A Pennsylvania utility optimized its dust control program through a variety of measures, including high chimneys for sulfur dioxide control, computer programs to predict ground-level SO2 concentrations, and a comprehensive SO2 monitoring program. Abatement steps at individual stations include careful site selection, new bag filter systems, low-sulfur fuel, new electrostatic precipitators, and new venturi scrubbers to augment existing precipitators and mechanical collectors. Sulfur dioxide emissions from all stations meet present state ambient air quality standards. These specify 0.25 ppm SO2 as the maximum allowable one-hour concentrations, 0.1 ppm as a 24-hr average, and 0.02 ppm as an annual geometric mean. Ways of meeting more stringent SO2 standards and also potential limits on nitrogen oxides are being explored. Company investment inequipment and research will reach $40 million by the end of 1974.

17281 APTIC NO. 35672

Jones, Neville Murray

DIESEL FUEL ADDITIVE. *(Monsanto Chemical Ltd., London (England)) U. S. Pat. 3,493,354. 5p., Feb. 3, 1970. 11 refs. (Appl. Feb. 27, 1967, 13 claims).*

A shortcoming of many proposed barium additives to diesel fuels is the presence of barium in a form susceptible to extraction or partial extraction by any water which the composition or fuel containing the composition contacts. In the present invention, a composition is described in which the barium is stabilized in water-soluble form by the presence of an organic nitrogen compound. The most suitable quaternary ammonium salts are those containing at least two hydrocarbon groups, each of six or more carbon atoms, attached to the nitrogen group.

17282 APTIC NO. 35769

Kamata, Takeshi

EXAMPLES OF ENVIRONMENTAL IMPROVEMENT AND DUST COLLECTION METHODS FOR THE MELTING PLANT OF THE COPPER EXPANSION FACTORY. *(Shindo kojo ni okeru yokai kojo no kankyo kaizen to shujin hoho no jitsurei). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 38(12):1203-1210, Dec. 1971.*

The selection of the shape of a suction hood for an electric furnace dust collector depends on the type of the emission source, the process of pollution, the degree of mechanization or automation of the system, and the degree of discomfort the workers feel from all these factors. Previously, a canopy type or a side attachment hood was used in the melting plant, and both were dissatisfactory. Improvements were made on the design of the hood and one type, in which the emission source is entirely enveloped except for one opening, and another slit ring suction type hood were developed. The slit ring hood is installed over a low cycle electric furnace and is connected with a suction fan by a duct. The pressure inside the hood is maintained in the minus, the lowest pressure being near the suction hole. The pollution in the environment is effectively arrested even when the melting material is thrown into the furnace. However, since a relatively large amount of shavings are used as material, the cutting oil contained in the shavings can cause an explosive combustion. In the past, a temporary but drastic expansion of the volume of the gas has caused an overflow from the slit ring and pollution in the area, and damages from the radiation heat. The worst condition was created by the high temperature combustion gas on the connecting pipe, which in some cases lasted only one month. Various methods of solving this problem have been studied. A special apparatus for the pre-treatment of shavings has been developed.

17283 APTIC NO. 35832

Kawanaka, Shoji and Hiroshi Azuma

THE CHEMICO TYPE STACK GAS DESULFURIZATION SYSTEM. *(Chemico-shiki haien datsuryu setsubi). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochemicals), 15(12):48-53, Nov. 1971.*

The magnesium oxide slurry process and the MgO clear liquor process are explained with diagrams, and their characteristics are described. The idea of a centralized recovery plant for various factories is briefly introduced. A stack gas desulfurization process using a calcium compound and venturi scrubber and the throwaway process are described. The stack gas containing sulfur dioxide goes through a scrubber with a slurry absorbent containing calcium sulfite, calcium sulfate, and calcium hydroxide; dust particles, sulfur dioxide, and sulfur trioxide are absorbed. The absorbent is recovered by the dilay tank and is mixed evenly. The candy coating on the absorbent particles is dissolved and activity is recovered; the slurry then is recirculated back to the scrubber. The gas goes through a mist separater after coming out of the first scrubber and enters an identical second venturi scrubber. The gas is heated by an afterburner to 80 to 120 C before it is discharged through a stack. A throwaway process desulfurization system for a large capacity coal boiler (stack gas quantity 512,000 N cu m/h) is under construction. It will operate with an ash pond, and a plaster manufacturing process will be added in one year. A pilot operation obtained a 95% desulfurization result.

17284 APTIC NO. 35926

Kekre, S. Y.

REMOVAL OF H_2S IN FERTILIZER INDUSTRY – A SURVEY OF THE VARIOUS PROCESSES. *Chem. Age India, 22(6):333-337, June 1971. 7 refs.*

With regard to the fertilizer industry, the production of synthesis gas by gasification of indigenous raw materials like coal, coke, and other carbonaceous fuels containing appreciable quantities of sulfur, has gained importance. Because of operational difficulties with the synthesis gas carrying sulfur as an impurity, almost complete removal of sulfur is necessary. Hydrogen sulfide can be absorbed at high pressure, either physically or chemically, in a suitable solvent, or it can be oxidized to elemental sulfur either in the liquid phase or under dry conditions. In physical absorption processes, by reducing the pressure alone in a regenerator, solvent can be regenerated; for chemical absorption processes, heat energy in the form of steam is also required for regeneration of the solvent. Oxidative removal processes are generally restricted to low H_2S content, since heat removal is often serious because of the exothermic reaction. The absorption of H_2S is considered in water, ethanolamine, glycol amines, ammonia, alkacid, tri-potassium phosphate, selexol solvent, and methanol. Among the various liquid phase oxidation processes, the Thylox, Perrox, Ferrox, Manchester, and Vetrocoke processes are mentioned. Iron oxide, zinc oxide, and activated carbon processes are discussed. A Rectisol process, utilizing methanol as an absorbent at low temperatures, is the most advantageous among existing processes. (Author summary modified)

17285 APTIC NO. 35552

Kent, Roger F.

GAS SCRUBBER. *(National Dust Collector Corp., Skokie, Ill.) U. S. Pat. 3,581,474. 11p., June 1, 1971. 13 refs. (Appl. April 14, 1969, 19 claims).*

A new and improved gas scrubber is described which includes a wall structure having one or more grid assemblies readily removable and mounted thereon, as well as means for introducing finely divided droplets of scrubbing liquid into the gas flow passing through the openings in the orifice plate. Thus, the grid structure is accessible for service and replacement of components. The gas scrubber is extremely efficient in agglomerating, collecting, and removing contaminant particles, including those ranging in size from 10 micron on down, and yet requires a minimum amount of power and scrubbinng liquid per unit volume of gas being handled. The scrubber is more efficient and requires less maintenance than previous scrubbers.

17286 APTIC NO. 35487

Ketov, A. N., V. V. Pechkovskii, and V. V. Larikov

DRY LIME METHOD FOR REMOVING SULFUR DIOXIDE FROM FUEL GASES IN A THERMOELECTRIC POWER PLANT. V. REACTION OF CALCIUM OXIDE WITH SULFUR DIOXIDE. *(Soobshcheniye V iz Serii rabot. Sukhoy izvestkovyy metod ochistki topochnykh gazov TETS ot sernistogo angidrida. V. O. vzaimodeystvii okisi kaltsiya s sernistym angidridom). Text in Russian. Zh. Prikl. Khim., 44(7):1625-1629, 1971. 16 refs.*

Kinetic and thermogravimetric analysis and infrared spectroscopy were employed to study the composition of solid reaction products in calcium oxidesulfur dioxide and calcium oxide-sulfur dioxide-oxygen systems, the dependence of product formation on reaction temperature, optimal temperature for preliminary thermal treatment of CaO, and CaO sulfatization rates. Three kinds of CaO were used: CaO obtained by calcination of limestone, CaO obtained by calcination of chalk, and CP CaO. The CaO obtained from chalk showed the highest rate of sulfatization, but CP CaO had a higher rate at 1200 deg for the system $CaO-SO_2$. At all temperatures, CaO from calcinated limestone had the highest rate for the system $CaO-SO_2-O_2$. Calcium sulfite formed at 300-620 deg; calcium sulfide at 475-700 deg; calcium hyposulfite at 475-980 deg; and calcium sulfate below 365 deg. Optimal temperature for preliminary thermal treatment of CaO of all kinds was 1000 deg. Contrary to some literature data, SO_2 reacted with CaO at temperatures above 1000 deg.

17287 APTIC NO. 35139

King, James Frank, Jr.

FILTERING APPARATUS FOR THE FILTRATION OF GAS CONTAINING PARTICULATE MATTER ESPECIALLY OF AIR CONTAINING PARTICULATE POLLUTANTS AND THE APPLICATION OF THE FILTERING DEVICE. *(Filtervorrichtung zum Filtrieren von teilchenfoermige Materialien enthaltendem Gas, insbesondere von teilchenfoermige Verunreinigungen enthaltender Luft, sowie Verwendung der Filtervorrichtung. Text in German. (Bahnson Co., Winston-Salem, N. C.) Swiss Pat. 498,646. 16p., Nov. 15, 1970. (Appl. Aug. 20, 1969, 2 claims).*

A cylindrical filter-covered drum rotating rotating around its longitudinal axis in a stand on legs is described. One end of the drum is open and attaches to the gas duct supplying the polluted gas, the other end is closed. The gas filters radially through the filter cover from the inside of the drum outward. The dust accumulates inside the drum where it is removed by a suction device. The dust-laden filter cover is periodically cleaned by a nozzle blowing compressed air radially from outside of the drum through the filtering material. The nozzle moves on a rail alongside the drum. It remains stationary for one whole revolution, then moves by steps to remain stationary for a revolution at a time until the entire length of the drum is travelled, and the entire filter cleaned. The nozzle is then returned to its original position while the compressed air is stopped. The cleaning nozzle is connected to a blower attached to the filtering drum stand by a flexible tube. The apparatus is especially suited for the purification of air laden with waste from the cotton-carding process or from other types of textile processing.

17288 APTIC NO. 35140

King, James Frank, Jr. and Donald Alfred Sloan

FILTERING APPARATUS FOR THE FILTRATION OF GAS CONTAINING PARTICULATE MATTER ESPECIALLY OF AIR CONTAINING PARTICULATE POLLUTANTS. *(Filtervorrichtung zum Filtrieren von teilchenfoermige Materialien enthaltendem Gas, insbesondere von teilchenfoermige Verunreinigungen enthaltender Luft). Text in German. (Bahnson Co. Winston-Salem, N. C.) Swiss Pat. 498,645. 8p., Nov.15, 1970. (Appl. Aug. 20, 1969, 1 claim).*

Filtration is accomplished by a cylindrical filtering drum on a stand on legs rotating around its longitudinal axis. One end of the drum is open, the other is closed. The open end is tightly attached to a gas duct supplying the polluted gas. The drum itself is covered with a filtering material; the particulates accumulate inside the drum while the purified gas reaches the outside. Inside the drum is a suction device with a rectangular funnel opening pointing upward which removes the accumulated dust by suction through a tube leading outside the drum and forming its pivot. The dust-laden filter cover is periodically cleaned by a compressed air nozzle connected to a blower by a flexible tube. The nozzle is attached to a carriage which glides on a rail fastened parallel to the drum mantle. Compressed air blows from the stationary nozzle against the rotating drum through the filter for one revolution. Then the nozzle carriage moves by steps for one rotation of the drum at a time, until the entire length of the drum is travelled, and the entire filter cleaned. The carriage then returns to its original position with the air automatically stopped.

17289 APTIC NO. 35759

Kipot, N. S., A. I. Brodovich, and V. M. Zaychenko

BRUSH DISCHARGE FILTERS USED FOR THE REMOVAL OF NITRIC OXIDE FROM COKE OVEN GAS. *(Ochistka koksovogo gaza ot okisi azota v elektrofiltrakh s kistevym razryadom). Text in Russian. Koks i Khim., no. 5:31-34, 1971. 10 refs.*

Removal of nitric oxide from coke oven gas by means of electric brush discharge filters was investigated on a pilot plant. The voltage potential promotes conversion of oxygen (contained in the coke oven gas) into ozone, which enhances the oxidation of NO into nitrogen dioxide. Removal of NO from coke oven gas is affected by the voltage potential created within the electric filter, by the period of permanence of the gas within the filter, and by its initial content in NO. A certain volume of gas to be cleaned should spend at least nine seconds within the filter under conditions of 32 kilovolt to achieve a 93% removal of NO. The efficiency of this cleaning process is optimal under conditions of 41 kilovolt, but increased initial concentrations in NO produce negative results. Thus, concentrations of 0.62 cu cm/cu m NO achieve a 93% cleaning of the coke oven gas, while initial concentrations of 3.66 cu cm/cu m NO decrease the extent of the cleaning process to 72%. Both observations were carried out with 34 kilovolt potentials. A mathematical relationship expressing the dependence of the cleaning process upon the three mentioned factors effects design criteria for such gas cleaning facilities according to the cleanliness to be achieved and the initial concentrations in NO existent in the given gas.

17290 APTIC NO. 35554

Klein, Nicholas

SMOKE CLEANING APPARATUS. *(Assignee not given.) U. S. Pat. 3,582,051. 7p., June 1, 1971. 4 refs. (Appl. Jan. 8, 1969, 10 claims).*

Previous apparatus for reducing air pollution caused by smoke discharging furnaces and incinerators has been limited to filters of various kinds, generally screens placed at outlets of chimneys. These filters have not been satisfactory because they quickly become clogged and ineffective. Electrostatic precipitators have limited applications since they are complex, expensive, and most suitable for extremely fine particles. In the present process, smoke bearing large particles is first passed through a conical baffle assembly made of closely spaced overlapping rings at the bottom of a smoke stack or chimney. The conical baffle assembly holds back larger particles which fall back to the furnace for reburning and removal via cleanout doors in the furnace. The smoke then passes through helical baffles in which an apertured spray pipe sprays water to cool the smoke and fumes and entrap more particles in the smoke. The dirty water flows down to the conical baffle and is then drained off to a sewer or filter tank and recirculating pump. The cleaned smoke is then deodorized by a sprayed deodorant and passes up out of the chimney to the atmosphere.

17291 APTIC NO. 35726

ock, Putte

ON SMOKES AND SULFUR. *(Om rokgaser och svavel). Text in Swedish. Forum, no. 14:14-15, Sept. 22, 1971.*

About 80 million tons of sulfur dioxide are emitted yearly into the atmosphere. Sulfur dioxide emission by Finland is 500,000 tons/year. Chief sources of SO2 in Finland are sulfurous combustibles, cellulose industry, and processing of different ores. The switch to combustibles with lower sulfur content and desulfurization of fuel or smoke are among the methods discussed. Desulfurization of smoke is more economical for large plants than of combustibles. Over 100 methods have been developed for smoke desulfurization. Several methods are based on a combination of the following chemical and physical principles: solubility in liquids, adsorption or absorption on solids, catalytic oxidation, reduction, and neutralization. The methods can be distinguished as dry and wet, and waste and reclaim methods. Very few methods have been tested on a full scale until now. The best of these waste control methods are: combustion engineering, Bischoff, and Bahco methods. All three methods treat the smokes with limestone or burned lime. The best reclaim methods are: alkalized alumina, Monsanto, and Bergbau-Forschung. These methods are briefly described. Desulfurization would raise the cost of one kWh of electricity by one penny. Lower-sulfur combustibles shall be used until better technical solutions for more economical desulfurization are found.

17292 APTIC NO. 35703

Koepernik, Karl Hermann

A METHOD OF PRODUCING A CATALYST OF LOW SENSITIVITY TO LEAD FOR OXIDISING THE EXHAUST GASES OF MOTOR CARS. *(Kali-Chemie A. G., Hannover (West Germany)) Brit. Pat. 1,143,823. 4p., Feb. 26, 1969. 3 refs. (Appl. Sept. 21, 1966, 8 claims).*

A method of producing a catalyst of low sensitivity to lead is presented for oxidizing exhaust gases of automobiles. A pseudoboehmite with an ignition loss of 24 to 30% and a sodium monoxide content below 500 ppm is made into a paste with a solution of an ammonium salt of a volatile acid and with acetic acid, hydrochloric acid, or nitric acid. It is then extruded, dried at 50 to 70 C, calcined at 800-900 C, and impregnated with a solution containing 0.5 to 3 gram atoms each of copper and chromium per liter, dried, and finally activated at 750 to 850 C. The pseudoboehmite can be obtained in various ways, for instance by precipitation from the reaction of an aluminum nitrate solution with nitric acid, or by the hydrolysis of aluminum alcoholates or glycolates.

17293 APTIC NO. 36004

Koinuma, Yutaka, Kozo Egi, Yoshikazu Shimizu, Keiichi Inoue, Reiji Aizawa, Satoru Kobayashi, Hiroyuki Nishikata, Yasuhiro Takemura, and Keishin Matsumoto

HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST. *(Juyu no suisoka datsuryu ni kansuru kenkyu -- chojikan renzoku kassei shiken). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 6(6):373-390, Nov. 1971. 4 refs.*

The hydrodesulfurization of residual oil, the catalysts, supported metals, and their supported methods are discussed. The effects on the catalytic activity and catalytic life were investigated. Long run tests of 1,000 hours and 500 hours on the hydrodesulfurization reaction were carried out under the following conditions: Pressure 100 kg/sq cm, LHSV 1/hr, H2/oil (vol/vol) 1,000, reaction temperature 370 to 385 C. The dispersion state of supported metals contributed remarkably to the catalytic activity, its catalytic selectivity, and its catalytic life. A new catalyst, which has a long life of 5,000 hours or more, was discovered. Properties of produced oil and behavior of metallic compounds during the desulfurization were also studied. The results explained why the behavior of vanadium is different from that of nickel.

17294 APTIC NO. 36007

Kotera, Yoshihide, Naoyuki Todo, Kunihiro Muramatsu, Kiyoshi Ogawa, Minoru Kurita, Toshio Sato, Makoto Ogawa, and Toshiaki Kabe

STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL2O3. *(Juyu chokusetsu datsuryo shokubai no kenkyu (daiippo), moribuden-kobaruto-arumina shokubai no choseiho oyobi sono datsuryu kassei ni oyobosu eikyo). Text in Japanese. Tokyo Kogyo Shikensho Hokoku, 66(11):399-408, Nov. 1971. 21 refs.*

As a preliminary step in developing a molybdenum-cobalt-alumina hydrodesulfurization catalyst, suitable for a fluidized bed reaction, the influence of preparation methods on catalytic activity, the pore structure, and the behavior of molybdenum salts during the preparation procedure were examined. Two methods of preparation were investigated: the first was the coimpregnation method where calcined alumina is soaked in a molybdenum-cobalt salts solution; the second was a kneading method in which alumina hydrate is mixed and kneaded with the metallic salts solution. More active catalysts were prepared by the impregnation method. When the catalyst is prepared by the kneading method, the peak position of the pore distribution curve shifts towards a smaller pore radius. Molybdenum salts behaved differently during the two different preparation procedures.0

17295 APTIC NO. 35549

Kozak, Hiram C.

FLUID-HANDLING, GAS-SCRUBBING, AND BLAST FURNACE TOP PRESSURE CONTROL. *(National Steel Corp., Weirton, W. Va.) U. S. Pat. 3,582,050. 6p., June 1, 1971. 16 refs. (Appl. Sept. 27, 1968, 15 claims).*

A fluid-handling system is described for venturi scrubbing of dust-laden blast furnace off-gases. The pressure of the fluid is controlled by injecting control fluid into the passageway in open communication with the blast furnace top to increase and decrease the effective transverse cross-sectional area of the passageway at the location of injection. For smooth furnace operation, it is desirable to generally maintain a constant top pressure for a given set of operating conditions. Movable wall constructions which were previously employed are disadvantageous in that moving parts are necessarily exposed to the highly corrosive action of the dust-laden blast furnace gases.

17296 APTIC NO. 35878

Kriegel, E.

PERFORATED-BOTTOM WASHERS FOR THE EXHAUSTED AIR FROM PAINT SPRAYING SHOPS. *(Siebboden-Waescher fuer die Abluft von Lackieranlagen Entwicklungs-und Betriebsergebnisse). Text in German. Tech. Mitt. Krupp, 28(3):97-103, Sept. 1970. 2 refs.*

By analyzing the demands placed on a perforated-bottom scrubber for polluted air from paint spraying shops, first a functional model, then a pilot plant model, and finally operational equipment was developed. In such scrubbers the polluted air is purified by the gushing and foaming action of the wash water in easily removed perforated bottoms. The rate of air flow, the washing liquid requirement, the degree of foaming required, the degree of evaporation, pressure loss, and effectiveness of the washer were measured and compared with respective standard values exhibited by jet-, cascade-, and Venturi scrubbers. The perforations are smaller than in Venturi scrubbers which increases washing effectiveness. The rate of air flow can be adjusted so that part of the washing water constantly drains through the perforations, thus reducing the adhesion of paint particles to the bottoms. The washer is 2.4 m long, 1 m wide, and 2.3 m high; the perforations are rectangular, 15 mm long, and 5 mm wide. The washer has two bottoms, a sprinkler system, and a drip catcher; the lower bottom is inclined and arched, the upper bottom, horizontal. The slanting of the lower bottom, which faces the full impact of the paint-laden mist, is necessary to increase the density of the rinse water dripping through the perforations. The operational equipment has a 26,000 cu m/h rate of air flow, a washing water consumption of 30 cu m/h for both perforated bottoms, a pressure loss of about 40 mm H_2O for both bottoms, and 99.8% efficiency for paint mist concentrations up to 6 g/cu m.

17297 APTIC NO. 35558

Krug, H.

PHYSICAL PRINCIPLES OF A.C.-OPERATED ELECTROSTATIC PRECIPITATORS. *Luftverunreinigung, 1969:40-46, Oct. 1969. Translated from German. Central Electricity Generating Board, London (England), Information Services, 11p.*

In direct current operated electrostatic filters, with increasing size of the deposition surface, the maximum permissible operating voltage decreases, and then when the deposition surface is increased still further it tends towards a constant minimum value. Since reverse discharges may occur during the separation of high-resistance dusts, conditioning and/or cooling of the flue gas is often necessary. It is true that in the alternating current filter reverse discharges also occur from a definite resistivity of the deposited dust layer upwards, but the reverse discharges have only a slight effect on the efficiency of the precipitator. Operating variables and design criteria are presented for the alternating current electrostatic precipitator.

17298 APTIC NO. 35809

Kuhn, A. T.

ELECTROCHEMICAL METHODS FOR SO2 FLUE GAS TREATMENT. *J. Appl. Electrochem., 1(1):41-44, 1971. 15 refs.*

The three main published electrochemical methods for recovering sulfur dioxide from flue gases are the Stone Webster/Ionics, Pintsch-Bamag, and Simon-Carves processes. The first two methods are very similar, each employing caustic soda wash-liquor and an electrodialysis cell with an iron-exchange membrane. Products of electrodialysis are sulfuric acid, hydrogen, sodium bisulfite and caustic soda, and oxygen. The third method uses sulfuric acid as the wash-liquor; after electrolysis, the product is persulfuric acid which leads to hydrogen peroxide or the per-salts. The economics of the methods do not appear promising for factories. In the case of the domestic chimney, which is a far more important source of pollution that the industrial chimney, convenience factors may overide purely financial ones.

17299 APTIC NO. 35758

Kulikov, G. S., B. I. Byalyy, Yu. P. Khlebnikov, and V. D. Shevchenko

STUDIES ON THE REGENERATION OF UNWOVEN FILTER FABRICS. *(Issledovaniye regeneratsii netkanykh filtruyushchikh materialov). Text in Russian. Vodosnabzh. i Sanit. Techn., no 8:28-30, 1971. 6 refs.*

The feasibility of regeneration of synthetic fiber made from unwoven filter fabrics was investigated. Simultaneous vacuum and ultrasonic processes achieved above 90% filtering efficiency within 0.3 sec. The air flow rates applied at the inlet of the suction funnel ranged between 19-20 m/sec. The dust catching efficiency of these fabrics increased following three or four regeneration cycles, due to the self-filtering action of the non-removed dust layer which accumulated within the body of the fabric. A certain decrease of filtering efficiency was observed after multiple regeneration cycles and was due to the stretching of the fabric exposed to these procedures. Regeneration of unwoven fabrics appeared to be feasible and convenient, to a certain extent, for economical reasons.

17300 APTIC NO. 35085

Kurita, Manabu, Takashi Watanabe, and Naoki Takayama

HYDRODESULFURIZATION IN KHAFJI RESIDUE OIL. *(Kafuji genyu zanyu no suisoka datsuryu kassei ni oyobosu shokubai chosei joken no eikyo). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(11):2264-2268, Nov. 1971. 7 refs.*

Hydrodesulfurization experiments of Khafji residual oil were conducted in a stabilized catalytic bed using cobalt, molybdenum, alumina, or silica alumina catalysts, with a flowing desulfurization reaction, at the temperature 430 C, gauge pressure 100 kg/sq cm, liquid speed one liter/0.1 hour, hydrogen/oil volume ratio 1000 Vol/Vol, for 50 hours. The influences of the atomic ratios of catalytic metal compositions, the catalytic formation temperature, and added silica catalyst were all examined. The hydrodesulfurization activity of cobalt/molybdenum/alumina catalyst was influenced by the atomic ratio of Co/Mo, by the degree of sulfurization, and the amount of carbon extraction, and that these factors were mutually and closely interrelated. In this experiment, the desulfurization activity was marked the highest at the Co/Mo atomic ratio of 0.5-0.8, and within this range, the extraction of carbon by catalyst was noted as minimum, and sulfurization was 73 to 79%. The highest result was obtained within this range by the catalyst formed at 650C. A catalyst containing silica showed a decrease in desulfurization activity.

17301 APTIC NO. 35920

Kurita, Satoru, Tasashi Watanabe, Hideo Satori, Shinji Nishizaki, Naoki Takayama, Kiyoshi Tabuchi, and Jun-ichi Sakuma

CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL. *Bull Japan Petrol. Inst., 13(2):162-168, Nov. 1971. 6 refs.*

The catalytic hydrodesulfurization of Khafji residual oil (topped crude oil distilled at 300 C and one atmosphere) was studied using large and small fixed bed reactors with down flow system at a temperature of 350 to 430 C, pressure of 50 to 110 kg/cu cm, liquid hourly space velocity of 0.5 to 2.0 vol/vol/ hr, and hydrogen/oil volume ratio of 125 to 1,800 vol/vol. Cobalt-molybdenum-alumina catalysts were used. The reaction rate was second order with respect to the sulfur concentration of the residue and the rate constant was first order with respect to pressure. The rate constant increased rapidly with increase of the H_2/oil ratio in the range up to 500 vol/vol of H_2/oil ratio and slowly in the range of 500 vol/vol to 1,800 vol/vol. The activity of the spherical catalyst of one mm phi was higher than that of two mm phi. Also, the rate constant increased with increased height of the catalyst bed and linear velocity of feed residue. The modified second order formula that takes the scale effect of the reactor geometry into consideration was introduced as the function of residence time.

17302 APTIC NO. 35660

Lardieri, Nicholas J.

PRESENT TREATMENT PRECTICE OF KRAFT MILLS ON AIR-BORNE EFFLUENTS. *Paper Trade J., 142(15):28-33, April 14, 1958. 7 refs.*

A survey was conducted to ascertain what methods are used for treatment of atmospheric effluents from kraft pulping mills; 58 mills participated. The types of recovery equipment used, specific abatement techniques for various effluents, costs of abatement processes, and the public relations aspects of the problem were considered. The equipment used for collection of particulate matter and aerosols from recovery furnace stacks included electrostatic precipitators (50 mills) and venturi scrubbers (nine mills) two mills used no equipment whatever. Wet scrubbers were used by 54 mills and dry dust collectors by one to control lime kiln exhaust; one mill did not use any control equipment. Odorous emissions from the kraft industry occur primarily from digestion and chemical recovery. Some reduction in these emissions from digester gases is achieved in most Southern kraft mills through the turpentine recovery system. Odors from the black liquor recovery systems arise from the multiple-effect evaporator condensates and from furnace stacks. Methods used to abate odors from these sources are scrubbing of evaporator noncondensables with caustic or black liquor, air oxidation of black liquor prior to recovery, and odor-masking of catalytic reactant compounds. Capital costs are about $1000. per ton of productive capacity.

17303 APTIC NO. 35989

Lauderback, William

UNIQUE FLARE SYSTEM RETARDS SMOKE. *Hydrocarbon Process., 51(1):127-128, Jan. 1972.*

At its Longview plant, Texas Eastman Co. has nine horizontal flares varying in size from 8 through 42 inches for which conventional smoke suppression equipment was inadequate. The use of conventional equipment would require conversion from horizontal to vertical flares, a costly and time-consuming process. A system that employs finely divided water spray to eliminate smoke from the horizontal flares of the hydrocracking plant was devised. Installation and operating costs of the system are low.

17304 APTIC NO. 35721

Lee, G. K., F. D. Friedrich, and E. R. Mitchell

CONTROL OF SO_3 IN LOW-PRESSURE HEATING BOILERS BY AN ADDITIVE. *J. Inst. Fuel, 42(327):67-74, Feb. 1969. 12 refs.*

Residual fuel oil containing 2.5% sulfur was burned under conditions prevalent in heating boilers to assess the effect of boiler load, excess combustion air, mean residence time, and the use of a magnesia-alumina fuel-oil additive on the formation of noxious and corrosive combustion products. The results show that the additive can be used as an effective substitute for low excess combustion air in reducing the emission of nitrogen oxides and sulfur trioxide. Furthermore, the additive neutralizes condensed sulfuric acid and improves the electrical resistivity of soot particles to the point where electrostatic precipitation of soot is technically feasible. By neutralizing acid and acid soot, the additive successfully controls low-temperature corrosion of heat exchange surfaces. In low-pressure steam boilers, the deposition of acid soot on furnace walls will result in relatively low SO_3 and RBU readings in flue gas farther downstream. Therefore, any assessment of corrosion potential in such equipment must be analyzed with respect to both furnace and combustion conditions. (Author abstract modified)

17305 APTIC NO. 35538

Lee, Hanju

RATE OF SULFUR DIOXIDE SORPTION BY ALKALIZED ALUMINA. *Chem. Eng. Progr. Symp. Ser., 67(115):35-45, 1971. 7 refs.*

Data of sulfur dioxide sorption from a simulated stack gas by alkalized alumina beads were analyzed based on the unreacted core shrinking model. The rate of sulfur dioxide sorption by alkalized alumina is controlled initially by the chemical reaction step, by both chemical reaction and diffusion through the product layer in the intermediate stage, and by diffusion through the product layer at the end. Particle size of the prototype alkalized alumina beads affects both reaction rate constant and effective diffusivity in the product layer. (Author abstract modified)

17306 APTIC NO. 35251

Locke, Carl E., Patrick E. Cassidy, and Gary C. Rolls

DEVELOPMENT OF A TEST FACILITY AND SPECIFICATION FOR BREATHABLE AIR FILTERS (FINAL REPORT). *Tracor, Austin, Tex., Naval Ship Systems Command Contract N00024-70-C-5365, Proj. SF27-523-110, Task 14258, Tracor Rept T-71-AU-9066-U, 59p., March 26, 1971. 8 refs.*

NTIS, DDC: AD 723608

An apparatus for testing filters used to remove oil mist from breathing air for divers was constructed of commercially available stainless steel tubing and fittings. A mist generator was developed to deliver an aerosol similar to that found in air compressors. The aerosol produced by this generator was characterized in quantity as a function of air flow, oil viscosity, oil level, and air pressure. The particle size range of the mist was also determined. The apparatus was evaluated in testing commercially available filters. Low pressure testing was conducted at 65-75 psig utilizing air flows of 40 scfm. Oil loadings of about 700 micrograms/liter were used at temperatures up to 250 F. High pressure test conditions were 2000 psig with air flows of 6-9 scfm. The oil loadings were 356-533 mg/liter which were much larger than expected. (Author abstract modified)

17307 APTIC NO. 35609

Lorentz, Fred

A CHEMICAL PLANT S SOLUTION OF AERIAL POLLUTION AND WASTE DISPOSAL. *Chem. Eng. Progr., 46(8):377-379, Aug. 1950.*

The principal potential air pollution offense at a New Jersey pharmaceutical plant arises from a few steps in the vitamin B1 synthesis where the production and handling of sodium dithioformate is involved. The vapors have a garlic-sulfide stench. Activated carbon is the most effective method of arresting the airborne odors which cannot be easily destroyed by chemical scrubbing solutions. The odor adsorption system consists of a low speed exhaust fan drawing 12,000 cu ft/min of air at three-eighths-in. standard pressure through a manifold duct system connected to the vents of about 15 pieces of equipment, all handling the malodorous intermediates. This method is convenient to operate and has a high capacity resulting in a fairly long adsorbing cycle. Flexible design of an incinerator makes it possible to dispose of large quantities of a wide variety of liquid and solute wastes in a completely innoxious manner, even to the extent of disposing of objectionable aqueous solutions.

17308 APTIC NO. 35653

Love, L. O., W. A. Bell, Jr., W. K. Prater, G. M. Banic, and A. E. Cameron

PRESENT STATUS OF ELECTROMAGNETIC SEPARATION OF STABLE ISOTOPES AT THE OAK RIDGE NATIONAL LABORATORY. *Proc. Intern. Symp. on Isotope Separation, Amsterdam, Netherlands, 1957, Chapt. 52, p. 615-61. 1 ref. (April 23-27, 1957.)*

Of the four electromagnetic separators in use at the Oak Ridge National Laboratory, the two Alpha units have a radius of 122 cm and the two Beta units operate on a radius of 60 cm. The smaller radius separators are generally used for separation of elements up to about mass 100, and they are also used when recovery of the charge material is imperative because of high cost or because of scarcity. Since Sept. 1955, twenty-four elements have been processed to recover usable amounts of separated nuclides. Separations with calcium, silicon, and europium were made with starting material of natural isotopic composition; on the other hand, lithium and boron separators are second stage, in that the feed had already been enriched. A grid type of ion source used for the lithium collection is described. Collection of high purity silicon is also mentioned, and retention of impinging material is considered. Electromagnetic separation is being supplemented by some thermal diffusion work with the inert gases.

17309 APTIC NO. 35762

0Low, M. J. D., Arthur J. Goodsel, and Nobotsune Takezawa

REACTIONS OF GASEOUS POLLUTANTS WITH SOLIDS. I. INFRARED STUDY OF THE SORPTION OF SO2 ON CAO. *Environ. Sci. Technol., 5(12):1191-1195, Dec. 1971. 23 refs.*

The sorption of sulfur dioxide on calcium oxide at 25 C and the thermal decomposition of the sorbed layer in vacuum at up to 0750 C were studied by infrared spectroscopic techniques. Sulfur dioxide was sorbed in at least three forms. The main interaction of SO2 with degassed CaO was irreversible and led to formation of a surface sulfite. A reversible chemisorption occurred at high degrees of surface coverage. Sulfur dioxide was then physically adsorbed on top of the more tightly bound species. On heating in vacuum, some surface sulfite was converted to surface sulfate at 550 C; at higher temperatures, conversion to sulfate and polymerization occurred, a mixture of species being formed. Heating in oxygen converted the mixture to species resembling bulk CaSO4. (Author abstract modified)

17310 APTIC NO. 35879

Ludington, David C., Albert T. Sobel, and B. Gormel

CONTROL OF ODORS THROUGH MANURE MANAGEMENT. *Trans. ASAE (Am. Soc. Agr. Engrs.), 14(4):771-774, 780, July-Aug. 1971. 2 refs. (Presented at the American Society of Agricultural Engineers, Winter Meeting, Chicago, Ill., Dec. 1969, Paper 69-936.)*

Two different experiments were conducted to check the influence of moisture removal and manure removal on the odor offensiveness of the gases released from chicken manure. An odor panel was used to evaluate odor offensiveness. Results showed that removing moisture reduced the odor level. Diluted manure always produced the highest offensiveness and undiluted manure the next highest. Daily scraping, which did not allow for buildup of manure, also successfully controlled odor. A manure management system which either removes the manure from the building at least daily without manure buildup or removes moisture from the manure will cause a minimum amount of air pollution by the release of odorous compounds. (Author summary)

17311 APTIC NO. 35324

MacCabe, L. J.

AN INTERNATIONAL RESEARCH PROGRAM ON THE LIMITATION OF THE EMISSION OF POLLUTANTS BY AUTOMOBILES. *(Un programme de recherche international sur la limitation des emissions polluantes des automobiles). Text in French. Ingrs. Automobile (Paris), 44(45):473-487, 1971.*

Progress achieved by the Inter-Industry Emission Control (IIEC) program, launched in April 1967 by Ford and Mobile Oil and joined by Fiat, Mitsubishi, Nissan, Toyo Kogyo, and five oil companies is outlined. The program is scheduled to terminate by the end of 1971. Four types of experimental vehicles were built to determine by comparison the best and cheapest way of producing a low pollution car considering the price of the carburant, fuel consumption, the endurance of the system, its performance, and initial cost. The four systems built were a thermal reactor (afterburner) plus recirculation of exhaust gases (EGR system), a catalytic converter of hydrocarbons and of carbon monoxide plus the EGR system, a double-layer catalytic converter plus the EGR system, and a thermal reactor plus a catalytic converter plus the EGR system. The emission levels to be achieved, set in 1967, namely 0.82 g/mile hydrocarbons, 7.1 g/mile carbon monoxide, 0.68 g/mile nitrogen oxide, and no pollution by evaporation, were superceded by new goals envisioned for 1975. Even though the first three control systems did not achieve the emission reduction objectives set in 1967, work is still in progress on the fourth system which combines the features of all three partial systems. Recently Volkswagen and Toyota bought the results of the IIEC program.

17312 APTIC NO. 35997

Maeda, Isamu, Itsuo Tanaka, and Nobuo Ito

STACK GAS DESULFURIZATION BY ACTIVATED CARBON. (GAS SEPARATION METHOD). *(Gasu datsurishiki kasseitanho ni yoru haien datsuryu). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(12):1278-1283, Dec. 1971.*

The gas separation type activated carbon desulfurization method was developed after a period of research, and the test and operation results of the pilot plant and a larger scale trial plant were reported. The principles and characteristics of the adsorption process, separation process, sulfuric acid manufacturing process are discussed and the test results by the pilot plant, its operation and safety rate, sulfur dioxide elimination rate, the pressure loss and the influence of dusts, the deterioration rate of activated carbon, and the erosion of materials are discussed. The desulfurization rate of the plant was initially more than 90% as it was designed. But the carbon detereorated with the passing of time, and after a certain period, the capacity was found to level off, provided that new activated carbon be supplied periodically. Operating variables were tested by changing the quantity of stack gas, temperature, and SO2 concentration. When the amount of shifting activated carbon was predetermined, the desulfurization increased with the decrease of the gas quantity. When the gas quantity was set, the desulfurization rate increased with the increase of the amount of shifting carbon. The adsorption capacity of activated carbon was greatly influenced by the temperature of the stack gas. Under a given condition, the lowering of the temperature increased the SO2 elimination rate; however, the dispersion rate of the stack gas and the low temperature corrosion of flue must be taken into consideration. As the concentration of the gas increased, the desulfurization rate rose, but the absolute quantity of SO2 elimination decreased.

17313 APTIC NO. 35815

Malmgren, Edward N.

GAS CARBURETION FOR INTERNAL COMBUSTION ENGINES. *SAE Australasia, 31(5):200-203, Sept.-Oct. 1971. (Presented to the Society of Automotive Engineers of Australasia, Victoria Div., August 20, 1970.)*

Liquefied petroleum gases (propane and butane) give the most complete mixing of air and fuel for satisfactory performance of the internal combustion engine and for clean exhaust emissions. With gasoline, the momentum of the wet particles in the charge streaming through the manifold causes variations in the air-fuel ratio. The result is that some cylinders become too rich and the exhaust unclean. With properly tuned LPG, the amount of carbon monoxide in the exhaust equals the percentage normally present in the atmosphere. Moreover, LPG cannot wash cylinder walls and destroy lubrication. The fundamental requirements for gas carburetion are a pressure regulator and a mixer. The regulator is required to bring the cylinder pressure of 160 psi to zero at the mixer, which, like a bunsen burner, mixes and controls the air-fuel ratio.

17314 APTIC NO. 35881

Mande, S. S., K. Venkataraman, and S. K. Raman

SELECTION AND ADAPTATION OF A PROCESS FOR SULPHUR DIOXIDE REMOVAL FROM STACK GASES IN CONTACT SULPHURIC ACID PLANTS. *Indian Chem. J. (Bombay), 6(1):1-8, July 1971. 12 refs. (Presented at the Indian Institute of Technology, Symposium on Recent Trends in Chemical Engineering, Bombay (India), March 20, 1971.)*

In India because of lack of adequate employment, transport, and housing facilities, densely populated areas develop in the region of sulfuric acid plants. Adverse effects of sulfur dioxide on health and vegetation have been noted. Wet absorption processes for the removal of SO2 from exhaust gas are considered. The wet slurries for absorption include ammonium sulfite, aqueous ammonia, sodium sulfite and bisulfite, magnesium sulfate, and calcium hydroxide. Disadvantages of these processes are the large volumes of gases that must be cooled from 150-180 C to nearly room temperature and the absorbent slurry that must also be disposed of. Alkalized alumina, molten carbonate, and manganese dioxide-based adsorption processes are described. The use of pyrolusite ore seems to offer greater advantages, in India at least, and variations of this process which leads to the formation of manganese sulfate are presented.

17315 APTIC NO. 35093

Martin, Maurice

ACTION IN THE SMELTING INDUSTRY. *(Action dans l industrie de la fonderie). Text in French. Pollut. Atmos. (Paris), vol. 13:38-39, Oct. 1971.*

The control of dust emitted by cupola ovens which consume more than 50% of all coke used by foundries is the main problem. Dust emitted by foundry cupola ovens consists mainly of metal oxides, coke cinders, soot, and grease and is non toxic. Gases contain carbon dioxide, steam carbon monoxide, and oxides of sulfur. Carbon monoxide and unburned compounds are partly burned by the natural draft at the mouth of the furnace, sulfurous emissions are low because they are mostly absorbed by the melt or by the slag. The particle size range extends from less than a micron to more than a mm. Particles exceeding 50 micron in size form 70% of the total mass emitted. This dust represents a nuisance only for the smelter area. Twenty percent of the mass of dust are particles within a range from one to 50 micron which are a nuisance to the environment, and 10% of the emitted dust are particles smaller than one micron. These particles form visible smoke which is dispersed in the atmosphere. At the base of the stack, the dust carried by the gas amounts to three to 15 g/cu m or to two to ten kg/ton pig iron. A wide range of dust removal equipment is available for all sizes of smelters; cinders can be controlled by mechanical static chamber dust arresters situated at the base of the stack. Medium size dust can be controlled by cyclones or by a combination of static dust arresters with cyclones to a residual dust content in the escaping gases of 0.2 to 0.5 g/cu m. Visible smoke emission can be controlled by 90 to 99% by electrostatic filters, bag filters, or wet dust removal equipment. Dust control equipment for complete dust control can amount to several times the cost of the cupola oven.

17316 APTIC NO. 35316

Masaki, Kenji and Hiroyuki Marvoka

APPARATUS FOR REDUCING HYDROCARBON CONTENT OF ENGINE EXHAUST GASES DURING DECELERATION OF AUTOMOBILE. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,590,792. 11p., July 6, 1971. 9 refs. (Appl. Dec. 5, 1968, 6 claims).*

A system is described which is capable of reducing the hydrocarbon content of engine exhaust gases produced during deceleration of an automotive engine. The system comprises an apparatus which reduces the proportion of air in the air-fuel mixture to be drawn into the intake manifold of the engine when the carburetor butterfly valve is substantially closed and a means for introducing atmospheric air into the intake manifold concurrently with the reducing in the proportion of air in the air-fuel mixture, thereby reducing the intake manifold vacuum. (Author abstract modified)

17317 APTIC NO. 35480

Masaki, Kenji

APPARATUS FOR REDUCING HYDROCARBON CONTENT OF ENGINE EXHAUST GASES DURING DECELERATION OF AUTOMOBILE. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,590,793. 8p., July 6, 1971. 6 refs. (Appl. Dec. 5, 1968, 4 claims).*

Hydrocarbons vary during engine cycles and are highest during deceleration, due to the inability of the carburetor to supply the engine with an air-fuel ratio appropriate to the increase in manifold vacuum during deceleration. Therefore a system was developed to reduce the hydrocarbon content of engine exhausts emitted during automobile deceleration by controlling air-fuel ratio and the intake manifold vacuum. The air-fuel ratio and the intake manifold vacuum, which increases rapidly as the automoblie starts to slow down, are controlled by supplying air to the intake manifold of the engine by way of the step mixture supply flow path, kept substantially inoperative during deceleration, of the secondary side of a compound-type carburetor. (Author abstract modified)

17318 APTIC NO. 35735

Mashita, Takashi

WET TYPE DUST COLLECTORS. *(Shisshiki shujin sochi ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 38(12):1211-1216, Dec. 1971.*

A wet scrubber with a low differential pressure consists of a group of venturi pipes arranged horizontally in a casing, and jet spray nozzles at the entrance and the exit of the venturi pipe. Before entering a venturi pipe, the dust containing gas is evenly sprayed by a water jet and the gas is saturated by vapor. Condensation occurs around dust particles, and the particles grow in size as they approach the exit of the pipe. Another jet spray at the exit separates the dust from the gas, and eliminates the dust as sludge. Its characteristics are: small pressure loss; toxic gases are easily absorbed by the effective contact of the gas with the spray liquid; the gas load has little effect on the collection rate; easy maintenance and little wear. The Bischoff ring slit washer has a high differential pressure. It consists of a venturi pipe-shaped casing, a movable conical valve, a ring-shaped slit formed between the casing the valve, and a spray nozzle above the movable conical valve. The nozzle sprays the cleansing liquid and forms a cone-shaped liquid film which covers the cross section of the slit exactly. Characteristics are: even distribution of the liquid; a small amount of liquid can eliminate the dust effectively; no clogging occurs in the nozzle; easy maintenance; the nozzle opening is large and soiled water can be recirculated; the jet pressure is low and the wear is small; the adjustment of the gas passage (slit) is easy; and gas-liquid contact is effective.

17319 APTIC NO. 35959

Matsuno, Yoshizo and Masakatsu Hiraoka

PERFORMANCE ON ROTATIONAL VANE TYPE SCRUBBER. *(Shisaku kaitenshiki sukuraba no sochi seino). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(12):1384-1390, Dec. 1971. 3 refs.*

A scrubber with rotating vanes to create bubbles was devised; operating variables were examined with regard to dust collection rates. The test material was an air mingled with talc powder which was supplied from the lower gas entrance of the scrubber, and after going through the dust eliminating process, measurements were taken at the exit at the top of the scrubber. An ordinary tap water was supplied from the head tank as a cleansing medium. The scrubber consists of three layers of rotating vanes and perforated plates, with 15 cm distance between the layers, and another vane installed at the top in order to prevent splash. After the initial experiment with this structure, each part was taken separately and the collection rates with rotating vanes alone, perforated plates alone, and rotating plates and perforated plates were examined. The collection rate was consistent, regardless of the liquid-gas ratios. The collection rates were approximately the same whether rotating plates or vanes were used, the former might be more economical from the standpoint of power supply. These rates were found regardless of the number of layers, and thus only one layer of rotating plate and perforate plate would suffice for the collection of particles similar to talc. Theoretical analyses and correlations are presented.

17320 APTIC NO. 35595

McCabe, Louis C.

SANITARY ENGINEERING ASPECTS OF ATMOSPHERIC POLLUTION. *J. Sanit. Eng. Div. Proc. Am. Soc. Civil Engrs., vol. 80:392-1 to 392-4, Jan. 1954. (Presented at the American Society of Civil Engineers, Annual Convention, New York, Oct. 21, 1953.)*

The sanitary engineer has extensive experience with air pollution problems, notably waste disposal and odors. The need for odor control in industries which process dead animals may be greater than in the packing plants which are preparing food for human consumption. Some of the rendering plants in the Los Angeles area have used venturi jet condensers successfully but most rely on incineration to abate odors. Lack of cleanliness in maintenance may also account for odors around rendering plants. The greatest source of malodors in oil refineries are mercaptans which contain sulfur and are commonly derived from high sulfur crudes. Mercaptans may be removed from petroleum products by treating in a variety of processes, practically all of which utilize caustic action. Paint and varnish plants may discharge highly irritating substances such as acrolein, aldehydes, and fatty acids from their processes. Incineration of domestic household waste and garbage is generally not a sure means of eliminating odors in air pollution. Poor design, intermittent operation, and the character of the waste material are responsible for unsatisfactory operation. It is also recognized that hydrocarbons in the air may be oxidized to produce compounds which will damage growing crops and cause eye irritation. Some control equipment for dust, smoke, and fumes are noted.

17321 APTIC NO. 35127

McCaull, Julian

A LIFT FOR THE AUTO. *Environment, 13(10):35-41, Dec. 1971. 3 refs.*

Most automobiles have a flywheel in the front of the engine to stabilize operation of the internal combustion engine, and researchers at Lockheed Missiles and Space Company recommend adding a second flywheel behind the engine to help propel the vehicle. This new arrangement could lower the engine horsepower requirement by 60% which, in turn, would facilitate sharply reduced emissions of pollutants and decreased fuel consumption. Similar engine-flywheel hybrid systems in city buses would reduce city pollution, noise, and operating expenses. The flywheel is a disc or bar-shaped device that stores energy when spun to high speed. One of the major problems in tapping energy from the flywheel is to design a flywheel shaft and accompanying transmission that can safely convert the large amount of stored energy into usable power. Auxiliary power, testing for power, the limits of power, and power delivery problems are discussed. Two fiberglass flywheels were constructed for buses in order to test their feasibility. Construction materials are considered. Flywheels would reduce emissions from 3.25 g/mi hydrocarbons to between 0.69 0.08 g/mi, 36.90 g/mi carbon monoxide to 2.57 - 1.42 g/mi, and 3.22 g/mi oxides of nitrogen to 1.11 0.59 g/mi. These are almost within 1975 federal standards.

17322 APTIC NO. 35141

McWade, Duncan Roderick

METHOD AND DEVICE FOR IMPROVED COMBUSTION OF AIR-FUEL MIXES IN INTERNAL COMBUSTION ENGINES. *(Verfahren und Vorrichtung zur Foerderung der Verbrennung von Luft-Brennstoff-Gemischen bei Verbrennungskraftmaschinen). Text in German. (Assignee not given.) Swiss Pat. 505,288. 4p., March 31, 1971. (Appl. Aug.20, 1969, 2 claims).*

The method for improved combustion in internal combustion engines uses the preheating of intake air before it is mixed with fuel by a heating device fastened to the air intake filter. Preheating of air to 500 C contributes to improved fuel evaporation and thus to greater economy, reduces carbonization in the cylinders, reduces the amount of pollutants emitted with exhaust gases, burns all combustible substances present in the intake air, and prevents moisture from entering the carburetor. The heating device itself is a heat-insulated cylinder enclosing an insulated rod carrying an electrical heating coil. Both ends of the coil are connected to clamps on the outside of the cylinder with an electrical source. The rod is held in place in the cylinder by two discs attached at both ends of the rod. Air streams into the heating chamber through an air filter and through circular holes in the outside disc. It leaves the heating chamber and enters the engine through another air filter and circular holes in the inside disc.

17323 APTIC NO. 35517

Mills, G. Alex

GAS FROM COAL: FUEL OF THE FUTURE. *Environ. Sci. Technol., 5(12):1178-1183, Dec. 1971. 6 refs.*

To supply energy needs in the next 30 years, synthetic fuels from coal or corresponding increases in oil importation will be required. Synthetic pipeline gas, approaching the specifications of natural gas, is manufactured from coal by producing a synthesis gas followed by purification and catlaytic methanation. Special features of seven new coal gasification processes are described. A typical process begins with coal preparation in which coal is ground to a powder. It is then pretreated with air or oxygen to destroy the caking property, since heating causes some coals to swell and plug the reactor. The follows the gasification step in which synthesis gas is formed when steam and oxygen react with coal. This gas will contain varying amounts of carbon monoxide, hydrogen, and methane as valuable carbon dioxide and sulfur compounds as impurities that must be removed by further processing. The economics of the new coal gasification processes are illustrated. The fraction of the total price of the methane contributed is shown in each process step, and included capital, labor, and other charges in accordance with regulations for utilities.

17324 APTIC NO. 35803

Miyajima, Hiroshi

TREATMENT OF EMISSION GAS FROM RECOVERY BOILERS. *(Kaishu boira no haigasu shori ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and CCombustion), 38(12):1161-1176, Dec. 1971.*

The emission gas from the recovery boiler of a Kraft pulp mill enters an electrostatic precipitator and approximately 95% of eight to ten g/N cu m size dusts are collected. The gas then enters a wet cyclone scrubber and most of 0.4 0.5 g/N cu m size dusts are collected and some 0.15 to 0.2 g/N cu m dust particles remain. Altogether, 98 to 99% of the dusts are collected. The dusts are collected mostly by colliding with the spray liquid in the scrubber or diffusing or adhering to the surface of the liquid. The characteristics of this scrubber are its simple structure, easy operation, cleansing operation without power, little draft loss, a wide design possibility for a variety of particle sizes, types, and quantities, a small space requirement, a high collection rate of small particles, its multi-functions, and an excellent anti-erosion capacity. The odor is controlled by an alkaline solution additive in the scrubber liquid which absorbs hydrogen sulfide and mercaptans. The carryover of the dusts from the recovery boiler is successfully prevented by avoiding overloading, increasing the concentration of the black liquor, reducing the inorganic elements in the liquor, reducing the first air supply to the minimum, and decreasing the black liquor jet pressure.

17325 APTIC NO. 35931

Miyazaki, Shigeru

SO2 SCRUBBER FOR PULP AND PAPER MILL. *(Kami parupu kogyo ni okeru haien datsuryu no jisshirei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(12):1108-1114, Dec. 1971.*

A Swedish method of stack gas desulfurization was adopted by a pulp mill. The system comprises two conical scrubbers encased vertically in a cylindrical drop collector. The two scrubbers are each connected with a head tank where the absorbent is stored, and a pipe connects the two tanks. The exhaust gas from the boiler is sent to the lower scrubber and passes through the narrow passage between the lower end of the conical scrubber and the surface of the liquid absorbent at a high speed, causing the liquid to turn into aerosol mist and rise upward. The liquid particles have large surface areas and as they rise with the turbulent gas, contacts are made rapidly and effectively with the gas. Sulfur dioxide gas is almost completely absorbed at this stage. The guiding vane attached at the top of the lower scrubber rotates and circulates the gas, and by centrifugal action, makes the liquid drops adhere to the inner wall of the drop collector, and effectively separates the gas from the liquid. Most of the liquid is collected into the lower head tank through the recirculation pipe. The gas treated by the lower scrubber rises to the upper scrubber and escapes into the stack at the top of the drop collector. Fresh absorbent is supplied to the scrubber from the upper head tank and residual SO2 in the gas is effectively absorbed because of the high pH. Carbon dioxide is also absorbed. The absorbent with lower pH comes down to the lower scrubber. The CO2 scarcely reacts to the absorbent of low Ph. The CO2 absorbed in the upper scrubber exists in the form of sodium carbonate and reacts to SO2 and becomes sodium sulfite. The SO2 absorption rate is 95 to 98%, and the dust collection rate is more than 90%.

17326 APTIC NO. 35551

Morris, Charles W.

INTERNAL COMBUSTION ENGINE EXHAUST GAS TREATMENT APPARATUS AND METHOD. *(Assignee not given.) U. S. Pat. 3,581,490. 10p., June 1, 1971. 8 refs. (Appl. April 25, 1968, 11 claims).*

A method and apparatus are presented for removing the major contaminants in internal combustion engine exhaust gas. This is accomplished by reducing the nitrogen oxides in the presence of a copper-containing catalyst, then combusting the carbon monoxide and hydrocarbons with air and the heat released from the prior reduction of the nitrogen oxides. An oxidizing system is included with provisions for adding air and fuel to the oxidizing zone when the temperature of the exhaust gas is below a preselected temperature. Other advantages include the provision of a high temperature safety system which includes an exhaust gas flow control valve.

17327 APTIC NO. 35674

Muhlrad, W. and J. Remillieux

THE FORMATION OF ACID MISTS: USUAL METHODS OF REMOVAL. A NEW SOAKED FABRIC PROCESS. *(Formation de brouillards acides: procedes usuels de captation. Procede nouveau par tissue arrose). Text in French. Chim. Ind. (Paris), 103(21):2755-2763, Dec. 1970. 2 refs.*

The formation and evolution of particles of chemical and thermal origin are reviewed. Such particles have submicronic dimensions and cannot be removed efficiently enough in classical separators, unlike relatively coarse particles of mechanical origin. A new industrial filtration process for very fine particles is described in which washing gases and liquids are filtered through soaked fabrics. High degrees of efficiency, often exceeding 99%, are obtained. Results attained in industry are summarized. The use of synthetic fabrics such as propylene is of particular interest in the removal of acid mists.

17328 APTIC NO. 35049

Myers, P. S., O. A. Uyehara, and H. K. Newhall

THE ABCS OF ENGINE EXHAUST EMISSIONS. *SAE (Soc. Automot. Engrs.) Spec. Pub., no. 365:1-16, June 1971. 28 refs.*

Why certain exhaust constituents from vehicles are considered pollutants is indicated, and the formation of these pollutants in automotive operation is described. The techniques being used and considered to control these pollutants are also presented. The appearance of carbon monoxide in combustion processes is generally a simple result of oxygen insufficiency either on an overall or local basis. The nitric oxide concentration exhausted is controlled primarily by the rate of NO formation during the high-temperature part of the process. Fuel/air ratio and ignition timing also exert an influence on NO levels. Both temperature and oxygen concentration in the exhaust gases are important to the final concentrations of hydrocarbon emitted from the exhaust system. Formation and control of particulates and odors are also discussed. The effects of operating carbureted spark ignition engines, cylinder injection spark ignition, naturally aspirated diesel engines, turbocharged diesel engines, gas turbines, and external combustion engines are discussed. Vehicle emissions are analyzed. Thermal reactors and catalytic mufflers are mentioned.

17329 APTIC NO. 35962

Nakamura, Tsuneo

DEVELOPMENT OF APPARATUS FOR DESULFURIZING WASTE GAS FROM SINTERING OPERATIONS IN THE STEEL INDUSTRY. *(Tekkogyo ni okeru haien datsuryu sochi no kaihatsu ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(12):1121-1125, Dec. 1971. 1 ref.*

A desulfurization test was conducted in 1967 using a test apparatus with a 3000 N cu m/h capacity and diluted ammonia, and 98% desulfurization was achieved. In 1968, research was carried out toward an effective use of ammonia, a coke furnace by-product, for the treatment of sintering exhaust gas. The stack gas containing ammonia was sent to a scrubber and produced a 0.20% to 0.25% ammonia solution of industrial water. After naphthalene and tar were filtered, the solution was compressed and sent to the desulfurization system where it absorbed sulfur dioxide. The pH of the overflow was adjusted and the liquid waste was discharged. When using ammonia water with more than 8.0 pH, the SO2 concentration at the exit could be controlled to 10 to 50 ppm, but the treatment of a large quantity of waste liquid was necessary. Therefore, in 1970, efforts were concentrated on the treatment of absorbent. The liquid was returned to the desulfurization area, where it absorbed ammonia in the stack gas, and by reacting to sulfur dioxide, formed ammonium sulfite. A large scale research is being conducted now for nine iron and steel works which operate with blast furnaces. Some of the objects are the establishment of optimum operational conditions, clarification of material and heat loss in the circulation process, the treatment of absorbent waste, the safety of the system, the capacity of the absorption system, control of the circulation system, and tests for materials.

17330 APTIC NO. 35102

Neumann, Gerhard Max

A POCKET FILTER FOR AIR AND GAS PURIFICATION CONSISTING OF A BATTERY OF SINGLE ELEMENTS. *(Aus einer Mehrzahl von Einselgehaeusen gebildetes Taschenfilter zur Luft-und Gasreinigung). Text in German. (Delbag-Luftfilter G.m.b.H., Berlin (Germany)) Swiss Pat. 505,640. 7p., April 15, 1971. (Appl. Jan 20, 1970, 2 claims).*

An inexpensive absolutely leakproof pocket filter was developed which is suited even for fine dust filtration. The filter consists of seven individual housings inserted side by side into a rectangular frame which holds the unit together. Each element forms a support body of wire mesh bent into V-shape with a rectangular opening framed by a sheet metal strip. A V-shaped filter mat of a fibrous material is inserted into each rectangular opening and kept in place by a similarly shaped wire mesh expansion spring. The frames of the seven individual housing elements are spot welded to each other and to the outer frame. An airtight fit of the individual elements is achieved by means of a rubber sponge cord placed between the filter mat and the housing.

17331 APTIC NO. 35787

Nichols, Richard A.

CONTROL OF EVAPORATION LOSSES IN GASOLINE MARKETING OPERATIONS. *Preprint, Dept. of Commerce, Washington, D. C. and the Water Pollution Control Federation, Washington D. C., 37p., 1971. (Presented at the Technical Conference on New Technology in the Solution of Practical Problems in Air and Water Pollution. Control, Tokyo, Japan, Dec. 8, 1971.)*

Control of evaporation losses from gasoline storage tanks and at fuel transfer points in gasoline marketing operations is discussed. Cost figures are given for variable volume and floating pan-type roof tanks, and applications for vapor recovery systems are indicated. Promising new recovery methods are reviewed, most of which are based on high-pressure, ambient-temperature absorption of compressed vapors. With the spread of legislation requiring control of vapor emissions and the increase of field installation costs, the design of recovery systems is assuming increasing importance. Control legislation was first enacted in California, which requires a minimum recovery of 90% by weight of all hydrocarbon vapors from tanks and loading installations.

17332 APTIC NO. 36001

Norden, H.

ANALYTICAL CONSIDERATIONS CONCERNING THE HEATING SECTOR. (II). *(Bilanz im Heizungswesen (II)). Text in German. Oel Gasfeuerung, 16(12):1152-1162, Dec. 1971.*

Stricter regulations concerning emissions from heaters will cause increased developmental activity in the heating sector. Fuel oil S cannot be burned by conventional methods without soot formation. Measures are needed to prevent this. Should there be no success in the development of effective measures, oil-fired heaters will have to be equipped with waste gas filters. The soot development can be somewhat reduced by prolongation of the residence time in the flame section (vortex flame, cyclone, or corner firing). Flames can be prolonged by operating with a weak kinetic energy of the air, by having an oxygen deficiency in the flame axis, or by coarse atomization. With certain limits, ignition can be delayed with increasing viscosity. The time for full combustion is approximately proportional to the square of the initial droplet diameter. A droplet with a diameter of 400 micron takes 0.04 sec for full combustion, a droplet of 40 micron takes about 0.1 sec. Gaseous components burn about ten times faster than carbon particles. If strands with lack of air or with an overly rich supply of fuel oil occur in a flame, soot is formed. An air surplus causes an increased conversion of sulfur dioxide to sulfur trioxide. For a good combustion the oil mist must be uniformly distributed in the air and the air must be uniformly distributed across the cross section of the burner mouth.

17333 APTIC NO. 35793

Oglesby, Sabert, Jr.

ELECTROSTATIC PRECIPITATION. *Bull. S. Res. Inst., 26(2):3-9, Winter 1971.*

Electrostatic precipitators are assuming new importance as demands increase for better air quality. The three basic steps in the precipitator process are described along with dust properties influencing precipitation and the major uses of precipitators. Precipitators have their widest use in the collection of fly ash from coal-fired boilers at electric power stations and in the collection of dusts from recovery furnaces in pulp and paper mills. Other important users are iron and steel plants and cement plants. The two principal factors governing the ease with which dust can be precipitated are its particle size and electrical resistivity. The trend toward the use of low-sulfur coals is causing problems for fly ash precipitation, as the coals plus a flue gas temperature of 300 F result in high-resistivity dust. This problem can be handled by increasing precipitator size, reducing flue gas temperature, injecting conditioning agents in the gas stream ahead of the precipitator, or increasing the temperature to 600-700 F by putting the precipitator ahead of the air heater. While initial and installation costs of an electrostatic precipitator are higher than for other methods of particulate control, annual operating and maintenance costs are much lower.

17334 APTIC NO. 35349

Oguchi, Yutaka and Junichi Kubo

HYDRODESULFURIZATION OF HEAVY PETROLEUM HYDROCARBON OIL IN A FLUIDIZED REACTION ZONE. *(Nippon Oil Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,583,905. 6p., June 8, 1971. 7 refs. (Appl. June 10, 1968, 6 claims).*

Because of the presence of asphaltenes in heavy oil, hydrodesulfurization was difficult, due to the shortness of catalytic life. A new process for the hydrodesulfurization of a heavy petroleum hydrocarbon oil is more efficient. The oil, the hydrodesulfurization catalyst, and a hydrogen-containing gas are first passed into a fluidization initiating zone of a hydrodesulfurization reactor. The mixture is passed up through a fluidized reaction zone where the oil is hydrodesulfurized. The reaction product is passed into a separating zone of increased cross-sectional area compared to the cross-sectional area of the reaction zone; the hydrodesulfurized oil is withdrawn from the top of the separating zone, while substantially all of the catalyst separates down into the catalyst settling zone. The hydrodesulfurization catalyst is returned from the catalyst settling zone throuth the initiation zone to repeat the process. (Author abstract modified)

17335 APTIC NO. 35148

Ohlmeyer, Manfred and Wolfram Stotz

GAS FILTER ARRANGEMENT. *(Gasfilteranordnung). Text in German. (Gesellschaft fuer Kernforschung M. b. H., Karlsruhe (West Germany)) Swiss Pat. 503,512. 2p., Feb. 28, 1971. (Appl. Aug. 4, 1970, 1 claim).*

A filter arrangement is described whose air tightness can be easily checked by a row of fogging nozzles placed between the coarse and fine filters within the assembly of an inspection window in the filter housing. The row of fogging nozzles is connected by a pipe with an oil mist generator placed outside the filter housing. The oil mist blown by the nozzle facing the fine filter is absorbed by it. If the filter is not leakproof, the leak will be indicated by oil mist appearing on the outside of the filter where it will be seen through the inspection window. The arrangement will disclose leaks in the filter material proper, between frame and filter, and between frame and frame seat.

17336 APTIC NO. 35969

Oiwa, Tatsuyoshi

AN APPARATUS FOR DISARMING SULFUR OF SOOT AND SMOKE EXHAUST FROM AN OIL FIRED BOILER THAT HEATS A BUILDING. *(Biru danboyo boira no haien datsuryu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(12):1126-1132, Dec. 1971.*

A simple and compact stack gas desulfurization method for boilers for a heating system is discussed briefly with emphasis on its economical features. Ammonia gas is jet sprayed into high temperature flue gas and is mixed thoroughly, then water is jet sprayed. The heat of vapor is used and ammonium sulfite and ammonium sulfate are filtered through and washed in water. The method is widely applicable, the operation is easy and safe, the cost for installation and maintenance are low, and the desulfurization rate can be adjusted by the amount of ammonia gas sprayed. A 30 to 100% desulfurization is possible, and even with 30% desulfurization, up to 90% of the soot can be eliminated. Any crude fuel can be used and more than 99% desulfurization can be achieved, more than 90% soot elimination can be achieved. The costs for fuel, operation, desulfurization, and installation are reviewed by various types of heavy oil in a table form, and actual examples of such systems in operation are given.

17337 APTIC NO. 35333

Otvagina, M. I., Yu. P. Kuprayakov, N. I. Artemyev, V. F. Makarov, and V. I. Yavor

PRODUCTION OF SULFURIC ACID FROM REVERBERATORY FURNACE FLUE GASES. *(O vozmozhnosti proizvodstva sernoy kisloty iz otkhodyashchikh gazov otrozhatelnykh pechey). Text in Russian. Tsvetn. Metal., 44(7):5-6, 1971. 6 refs. (Includes comments by I. G. Sarkisov, Tsvet. Metal., 44(7):7-8, 1971.)*

Sulfur dioxide, hydrogen sulfide, and moisture levels in flue gases from reverberatory furnaces utilized in copper melting plants were determined to study their suitability for utilization in the production of sulfuric acid. Sulfur dioxide levels ranged from 1.74 to 5.30% according to the oxygen content of the air blast. Moisture varied from 14 to 17% and no H_2S was found. The minimal SO_2 content in these flue gases should be of two or three per cent in order that they constitute a suitable source for their further processing. In order to provide the necessary SO_2 levels, heating of the reverberatory furnace should occur with O_2 enriched blast (above 25% O_2) and the sulfur content of the processed batch should never decrease below 28%. The coefficient of oxidant supply should range between 1.05 and 1.10 in order to prevent the generation of hydrogen or aliphatic hydrocarbons in the flue gas. This condition requires automatic control of the fuel/oxidant ratio. The air pollution decreasing effects and economic aspects of H_2SO_4 production from flue gas are discussed.

17338 APTIC NO. 35927

Parnell, Calvin B., Jr. and Roy V. Baker

AN AUTOMATIC CONTROL SYSTEM FOR DIRECT COMPARISONS OF AIR POLLUTION ABATEMENT EQUIPMENT. *Preprint, American Society of Agricultural Engineers, Saint Joseph, Mich., 14p., 1971. 3 refs. (Presented at the American Society of Agricultural Engineers, Winter Meeting, Chicago, Ill., Dec. 7-10, 1971, Paper 71-567.)*

A control system designed to determine the operational efficiencies of three different air filter designs for a cotton gin condenser exhaust is examined. Particulate matter emitted by the exhaust consisted of cotton fibers and dust particles. Testing requirements, control system description and operation, and test results are summarized. The control circuit minimized the effect of variations of ratios of cotton fiber concentrations to dust particle. The system allowed for a much larger number of replications and a means for statistically removing the effect of nonuniform dust concentration of the unfiltered air. (Author summary modified)

17339 APTIC NO. 35471

Penney, G. W. and T. E. Alverson

INFLUENCE OF MECHANICAL COLLECTION ON ELECTROSTATIC PRECIPITATOR SPARKOVER VOLTAGE - A LABORATORY SIMULATION. *Inst. of Electrical and Electronic Engineers, New York, IEEE (Inst. Elec. Electron. Engrs.) Ind. Gen. Appl. Group, 5th Conf. Rec., Chicago, Ill., 1970, p. 261-266. 2 refs. (Oct. 5-8, Paper ES-2.)*

Experiments were conducted to study the effects that a mechanical collector might have on sparkover voltage in an electrostatic precipitator located downstream. The test equipment for determining sparkover voltage was designed to simulate the corona wires and collector plate of an electrostatic precipitator. The fly ash used in all sparkover tests was collected from precipitator hoppers in systems were no mechanical collector was installed. Two different techniques were used to simulate the effect of the mechanical collector on the fly ash samples: first, a vibrating sieve was used to remove the particles greater than 25 micron from the sample; second, a cyclone separator removed the large particles. Fines and whole fly ash from both methods were subjected to sparkover voltage tests. Measurements of sparkover voltage showed that the fines had a definite tendency to sparkover at a higher voltage than the whole fly ash. But measurements of dust resistivity also were higher for the fines than for the whole fly ash, since the large particles in the fly ash samples tested were more conducting than the fine particles. It thus appears that resistivity alone cannot be used to predict sparkover voltage. (Author abstract modified)

17340 **APTIC NO. 35086**

Pile, Gerard

ACTION BY THE OIL INDUSTRY. *(Action de l industrie du petrole). Text in French. Pollut. Atmos. (Paris), vol. 13:7-15, Oct. 1971.*

Measures which reduce pollution around oil refineries include correct siting of the refinery, the elimination of highly polluting technologies, the use of high stacks, the use of low sulfur raw materials, the introduction of pollution monitoring, and the education of personnel. All these measures resulted in a reduction of sulfur dioxide emission in the Basse-Seine region to from 0.3 to 0.8 mg/cu m and in other regions of France to from 0.1 to 0.4 mg/cu m SO_2. Very strictly enforced monitoring systems are in operation measuring the emission of gaseous pollutants, particulates, and odors. The construction of storage tanks with floating roofs minimizes losses through respiration, and the construction of pipelines minimizes transport losses. Refineries now supply fuel oil with a sulfur content of only 0.5% which with the partial replacement of coal by gas for home heating, accounts for a 35% decrease in SO_2 emission in Paris within the last five years (1964-1969). Pollution monitoring by larger sources has now become mandatory. Diversification of sources of supply of crude oil (especially the importation of low sulfur crude oil) has reduced the average sulfur content in oil from 3.3 to 2.45%. The best use of low sulfur crude is not to mix it with high sulfur crude, but to use it as fuel oil. The costs and feasibility of various processes designed to desulfurize high sulfur crude or residues and to desulfurize combustion gas are compared. All methods are costly and not really satisfactory.

17341 **APTIC NO. 35772**

Pogrebnaya, V. L., A. V. Baranov, and T. B. Malchikova

ABSORPTION OF NITROGEN OXIDES BY ACID SUSPENSION OF VANADIUM PENTOXIDE. *(Issledovaniye absorptsii okisi azota kisloy suspenziyey pyatiokisi vanadiya). Text in Russian. Izv. Vysshikh. Uchebn. Zavedenii, Khim. i Khim. Tekhnol., 14(4):532-534, 1971. 3 refs.*

Absorption of nitric oxide carried by an argon stream containing 0.2-2.5% NO by vanadium pentoxide suspended in 3.0-50% nitric acid was investigated. Contact between the acid suspension of V_2O_5 and NO was achieved in a tightly closed thermostatic device at 293 K under conditions of a constant linear gas flow rate of 0.1/m/sec. The concentration of NO in the effluent gas varied linearly with the incoming concentration and decreased with increasing acid strength. The effluent concentration for a 1.0% NO incoming stream was 0.24% with 30% HNO_3 and 0.68% with 3.0% HNO_3. Vanadium nitrate concentrations above 60 g/l decreased the efficiency of the absorption process. Graphs expressing the variation of the efficiency of absorption with the concentration in vanadium nitrate and with the linear gas flow rate are reproduced. The method is applicable for the absorption of both NO and NO_2.

17342 **APTIC NO. 35706**

Post, Nicholas K. and Albert F. Layton

AIR POLLUTION AND TOTAL ENVIRONMENTAL HEALTH. *J. Air Poll. Control Assoc., 13(6):272-273, June 1963. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 55th, Chicago, Ill., May 20-24, 1962.)*

The method of odor counteraction was reviewed. Process odor counteractant formulas, although designed for specific odor descriptions may contain complex groups of odor counteractants. There is no chemical or mechanical method known for determining the effectiveness of odor counteractants. The principle of odor counteraction deals with the molecules of malodor. Odor counteractants are most effective when vaporized and combined with the air stream by molecular dispersion. Regardless of whether the stream of odors is held to the ground by an air inversion or is vertically or horizontally dispersed, the counteractant is carried with the malodor and is effective until the odor is dispersed beyond the range of perceptibility. Since odor counteractants are designed to neutralize specific odors, it is possible to eliminate not only the odor common to certain production operations but also the great variety of odors produced by complex mixtures of a large scope of industrial production. In addition to the more common industrial malodors, habitual offenders such as methyl mercaptan, methyl sulfide, amines, cresols, ketones, pyridines, and those of decomposition, may be adequately neutralized by odor counteractants.

17343 **APTIC NO. 35043**

Povey, Joseph H.

CATALYTIC INCINERATION CUTS METAL LITHOGRAPHY AIR POLLUTION. *Inland Printer/Am. Lithogr., 168(2):50-53, Nov. 1971.*

With catalyst manufacturers currently employing modern catalyst scanning test equipment coupled with computerized design criteria, highly effective catalytic incineration systems can be supplied for numerous applications in the printing and metal-decorating industries. In nearly every instance, the active catalytic agent for an air pollution control application is a precious metal -- either platinum or palladium. The principal advantages of precious metals are their unique catalytic activity, excellent high-temperature properties, chemical inertness, and ability to be reclaimed after use. Catalytic supports are described. The incineration of effluents is discussed for a typical web-offset operation and a typical metal-decorating plant. Thinning solvents and diluents in the former operation include aromatic hydrocarbons, alcohols, esters, and ketones. Lacquers and varnishes -- all of which contain substantial amounts of organic solvents -- are used in the latter plant. An in-house catalyst maintenance program is important right from the start to assure long life of catalyst packages. In the graphic arts and metal-decorating industries, a catalytic oxidation system is economically advantageous in comparison with either direct-flame or thermal incineration equipment.

17344 **APTIC NO. 35898**

Raben, Irwin A.

A REPORT ON THE EPA ALKALI SCRUBBING TEST FACILITY. *Rhode Island Univ., Kingston, Coll. of Engineering and Greater Providence Chamber of Commerce, R. I., Proc. North Eastern Regional Antipollution Conf., 4th, Kingston, R. I., 1971, p. 249-254. (July 13-15.)*

The detailed engineering of an alkali scrubbing test facility and the development of a test program began in July 1969. The test facility consists of three large pilot scrubbing systems connected to part of the flue gas exhaust system of a 150 Mw boiler unit. Each pilot plant will have a different type of scrubber system which will be tested to remove sulfur dioxide and particulate matter. The first scrubbing unit consists of a venturi followed by an absorber. The second scrubbing unit is the turbulent contact absorber, and the third scrubber is a marble bed scrubber, which contains a sieve tray on which there is a thin layer of marbles. Objectives of the limestone injection wet scrubbing process study are: to understand the interaction of the key variables involved in wet alkali scrubbing; to understand the process chemistry; to demonstrate the reliability of the process; to obtain data for scale-up to commercial size units; and to obtain data for economic analysis. The test program is described.

17345 **APTIC NO. 35178**

Reed, L. E.

THE REMOVAL OF SULPHUR DIOXIDE FROM FLUE GAS. *Smokeless Air (London), 34(127): 44-45, Autumn 1963. 5 refs.*

In the Battersea process, for removing sulfur oxides the flue gas is washed with large volumes of river water. The water itself supplies most of the alkalinity necessary to neutralize the sulfur oxides removed from the flue gas, but some additional alkali is added in the form of powdered chalk. The calcium sulfate produced is returned in solution in the water. This limits the amount of gas that can be washed with this process, because the river can never be allowed to become saturated with calcium sulfate. To overcome the limitations imposed by discharging the effluent into rivers, the Howden-I.C.I. process was developed in which the flue gas is scrubbed by a liquor which is kept alkaline by the addition of lime. The calcium sulfate formed is allowed to crystallize out and is then removed. However, this process is not economical. In the Fulham-Simon Carves process, which produces a saleable end-product, the flue gas is scrubbed by a solution of ammonium salts which effectively removes the sulfur oxides. The liquor is treated to produce ammonium sulfate and sulfur.

17346 APTIC NO. 35498

Roberts, Lawrence M.

ELECTROSTATIC GAS CLEANING. *(Research-Cottrell, Inc., Bound Brook, N. J.) U. S. Pat. 3,581,453. 3p., June 1, 1971. 30 refs. (Appl. Oct. 26, 1967, 3 claims).*

Difficulty has been encountered in the electrical precipitation of suspended particles or fly ash from combustion gases arising from the phenomenon of back discharge due to high resistivity of the particulate matter. It has been proposed to overcome this difficulty by catalytically converting sulfur dioxide in the gases to sulfur trioxide to increase the conductivity of the particulate material. However, the catalyst rapidly loses its efficiency and the catalyst bed rapidly increases its resistance to the flow of gases due to the accumulation of particulate material. Since combustion gases typically contain a much larger amount of sulfur dioxide than is required to produce the amount of sulfur trioxide desired, these difficulties can be avoided by subjecting only a small portion of the gases to catalytic sulfur dioxide conversion after removing from the small portion a major portion of their suspended particulate matter by precipitation at a high temperature. This minor portion is then mixed with the main gas stream either before or after it has been cooled, and the mixed gases are subjected to a conventional electrical precipitation operation.

17347 APTIC NO. 35521

Robinson, M. and R. F. Brown

ELECTRICALLY SUPPORTED LIQUID COLUMNS IN HIGH-PRESSURE ELECTROSTATIC PRECIPITATORS. *Atmos. Environ., 5(10):895-896, Oct, 1971. 7 refs.*

An electric field applied normal to the surface of certain liquids causes a liquid column to rise out of the surface. This effect has important commercial consequences in that it limits the voltage that can be applied in the removal of suspended liquid particles from high-pressure gases by electrostatic precipitation. (Author abstract modified)

17348 APTIC NO. 35069

Ron, Tsvia and M. Folman

MICROWAVE ABSORPTION AND POTENTIAL BARRIER FOR ORIENTATION. SULFUR DIOXIDE ADSORBED ON SODIUM CHLORIDE AND POTASSIUM CHLORIDE. *J. Phys. Chem., 75(17):2602-2609, Aug. 1971. 18 refs.*

Microwave absorption of sulfur dioxide adsorbed on finely powdered sodium chloride and potassium chloride was investigated in the 3000 MHz region. Relaxation time and free energy of activation for orientation were calculated. The energy of interaction of the molecule with the solid adsorbent was computed for different adsorption sites and orientations of the adsorbate and as a function of angle of rotation. The computed values of heat of adsorption and potential barrier for orientation were in good agreement with experimental values. (Author abstract modified)

17349 APTIC NO. 35814

Roth, James F.

COPPER-BASED AUTO EXHAUST CATALYSTS: MECHANISMS OF DEACTIVATION AND PHYSICAL ATTRITION. *Am. Chem. Soc., Div. of Petrol. Chem., Preprints, 16(2):E53-E58, March 1971. 11 refs. (Presented at the Los Angeles Meeting, March 28-April 2, 1971.)*

The physical attrition of copper-based exhaust catalysts on alumina supports was studied in road tests and in synthetic laboratory atmospheres. The road tests resulted in a marked depletion of copper from catalyst surfaces and appreciable deposition of lead on surface and subsurface layers. The laboratory tests identified cyclic oxidation-reduction as the cause of physical attrition of poorly dispersed copper-based catalysts in leaded or nonleaded atmospheres. Halides introduced into auto exhaust from the lead motor mix contributed significantly to deactivation via depletion of the active component from the catalyst surface. Highly dispersed catalysts had good attrition resistance even under cyclic conditions. The degree of dispersion of the copper component depends in part on copper content, support properties, and method of deposition of copper on the support. Mechanical properties of the support, beyond minimal levels of crushing strength, have little or no bearing on the attrition resistance of coper-based catalysts. (Author conculsions modified)

17350 APTIC NO. 35117

Ruckelshaus, William D.

WILL AIR POLLUTION REGULATIONS CHANGE COMMUTING PATTERNS? Civil Eng. N. Y.), 41(9):86-87, Sept. 1971. 3 refs.

Stringent emission limits set for 1975 and 1976 cars under the clean Air Act will reduce significantly the amount of pollutants discharged in, to the atmosphere. Nevertheless, in areas with large automobile populations and critically high levels of pollution from transportation sources, additional efforts will be necessary to meet national standards. The efforts might include traffic-engineering improvements, requiring commerical and government vehicles to run on low-pollution fuels, staggered working hours, more fringe parking, fewer downtown parking spaces, road fees, and even fuel rationing. In some areas, increased mass transit will be an absolute necessity.

17351 APTIC NO. 35765

Sado, Ichiro

INCINERATOR WITH A DUST COLLECTION DEVICE. *(Shujin sochi tsuki shokyakuro). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-31881. 3p., Nov. 4, 1971. (Appl. Nov. 12, 1965, 1 claim).*

A compact incinerator in which a cyclone is installed in order to eliminate large dust and sparks from the combustion gas is described. The incinerator comprises a grate in the combustion room, a cyclone chamber which is separated from the combustion chamber by a wall, a dust collection channel under the cyclone, and a refractory cylinder which is connected with a fan, a motor, and a stack. The gas from the combustion chamber enters the cyclone chamber through the opening on the wall, and large dust and cinder fall into the dust channel underneath. The dust channel can be pulled out and cleaned when necessary. The gas then rises through the cylinder and reaches the stack through the fan.

17352 APTIC NO. 36025

Saleem, A.

DESULPHURIZATION OF FLUE GAS. *Ont. Hydro Res. Quart., 23(2):23-28, 1971. 18 refs.*

Removal of the sulfur oxides present in power plant flue gases at low concentrations involves complex technical and economic problems. Wet-scrubbing processes are at a more advanced stage than other possibilities and likely will be the first to be commericalized. Regenerative systems, which rely on the sale of sulfur products to offset the additional costs, appear unattractive in view of the currently unfavorable market for sulfur products. Non-regenerative systems based on limestone, which convert the recovered sulfur oxides into disposable solid waste, hold the greatest promise for flue gas desulfurization in the near future. Catalytic oxidation and activated carbon processes are also mentioned. (Author abstract modified)

17353 APTIC NO. 35807

Sato, Shimpei, Yoichiro Hamano, and Kimiaki Tada

THE EXHAUST GAS ANALYSIS OF THE AUTOMOTIVE ENGINE EQUIPPED WITH THE LATEST ELECTRIC IGNITION SYSTEM. REPORT 1. THE ANALYSIS OF GAS UNDER NO LOAD. *(Saishingata denki tenka sochi-tsuki jidosha enjin no haiki gasu bunseki). Text in Japanese. Anan Kogyo Koto Senmon Gakko Kenkyu Kiyo (Res. Rep. Anan Tech. Coll.), no. 6:15-18, Feb. 1971. 5 refs.*

Improvements have been made in the electrical and mechanical parts of automobile engines. The latest electric ignition system raises the performance of the engine, makes starting easier, reduces fuel consumption, and reduces air pollution. Exhaust gases of engines equipped with the latest electric ignition systems were analyzed by gas chromatography, and the carbon monoxide content at a no load condition was determined.

17354 APTIC NO. 36013

Sato, Toshio, Tadao Sekine, and Naoyuki Todo

DETERMINATION OF MOLYBDENUM AND COBALT IN HYDRODESULFURIZATION CATALYSTS BY X-RAY FLUORESCENCE SPECTROMETRY. *(Yoekiho keiko ekkussen bunseki ni yoru datsuryu shokubaichu no moribuden oyobi kobaruto no bunseki). Text in Japanese. Tokyo Kogyo Shikensho Hokoku, 66(11):450-453, Nov. 1971.*

X-ray fluorescence analysis was applied to the determination of molybdenum and cobalt in hydrodesulfurization catalysts. Simple calibration curves were obtained with the ratio method, since the interference from other matrix elements in the catalysts was not observed. Good agreement was found with the results obtained by a conventional chemical analysis.

17355 APTIC NO. 35849

Scargill, D.

DISSOCIATION CONSTANTS OF ANHYDROUS AMMONIUM SULPHATE AND AMMONIUM PYROSULPHITE PREPARED BY GAS-PHASE REACTIONS. *J. Chem. Soc. A., no. 15:2461-2466, 1971. 18 refs.*

The products formed by gas-phase reactions between ammonia, sulfur dioxide, and water vapor diluted with air were identified by chemical analysis and infrared spectroscopy as anhydrous ammonium sulfite and ammonium pyrosulfite. The dissociation constants of these compounds were determined for the temperature range 273-298 K by a transpiration method. Results for complete dissociation fit the Arrhenius equations for sulfite and pyrosulfite respectively. The relevance of these reactions to air pollution problems is discussed, and results from this work indicate that removal of 95% of the sulfur dioxide from flue gases as ammonium sulfite could be obtained by use of a 10% stoichiometric excess of ammonia at a temperature of about 313 K. (Author abstract modified)

17356 APTIC NO. 35645

Schanz, John J., Jr. and Richard H. Parry

THE ACTIVATED CARBON INDUSTRY. *Ind. Eng. Chem., 54(12):24-28, Dec. 1962. 3 refs.*

About 105 to 110 million pounds of activated carbon are consumed annually for liquid purification and 10 million pounds for gas adsorption. Powdered carbons account for about 85% of the market on a weight basis and 70% on a dollar basis. Municipal water purification and sugar refining account for about 60% of total granular consumption. In the future, air pollution control will account for more carbon consumption, particularly regenerable, fixed-bed granular systems. At present the major sources of activated carbon are bituminous coal, coconut shells, lignite, petroleum residues, pulp mill residues, and wood charcoal. A future source may be anthracite. About 10 of the 90 available grades of activated carbon account for 90% of the market. Prices tend to be stable--seven to 40 cents/pound for the powder and 21 cents to $1.25 for the granular.

17357 APTIC NO. 35537

Schlesinger, M. D. and Eugene G. Illig

THE REGENERATION OF ALKALIZED ALUMINA. *Chem. Eng. Progr. Symp. Ser., 67(115):46-51, 1971. 2 refs.*

Alkalized alumina can be used for the removal of sulfur dioxide from stack gases. Before the pellets are recycled to the sorption section, they must be regenerated with a reducing gas. Several practical alternatives for regeneration are possible, resulting in single and multiple-stage mechanisms. Besides the reduction itself, consideration is given to side reactions that can have a deleterious effect on the ability of the sorbent to be reused, its ease of regeneration, and its physical properties. Data were obtained from a bench-scale system designed to study the mechanism and kinetics of the reactions. Regeneration can be accomplished at 600-700 C with hydrogen, carbon monoxide, and their mixtures. When carbon monoxide is used, some of the sulfate is reduced to the sulfide and a second-stage reaction with carbon dioxide is needed to complete regeneration to the reactive oxide. Data from this and other research are being used for the design of a prototype sulfur dioxide-removal plant. (Author abstract)

17358 APTIC NO. 35952

Schmid, Emmerich

METHOD AND EQUIPMENT FOR THE ADSORPTION OF AT LEAST ONE GASEOUS COMPONENT FROM A GAS MIXTURE. *(Verfahren und Anlage zur Adsorption mindestens einer gasfoermigen Komponente aus einem Gasgemisch). Text in German. (Gebrueder Sulzer A.G., Winterthur (Switzerland)) Swiss Pat. 506,318. 6p., April 30, 1971. (Appl. April 17, 1969, 3 claims).*

The method described allows adsorption of at least one gaseous component from a gas mix in an enclosure by means of a solid adsorbent contained in an adsorption tank; the treated gas mix is then returned to the enclosure. Each adsorption period is followed by a regeneration period using a desorbent. The method can be used for the removal of carbon dioxide from consumer gas (thus increasing its caloric value), but applies principally to the partial removal of CO2 from fruit, vegetable, flower, and mushroom storage rooms. The adsorption tank contains granular activated charcoal or zeolith between two perforated bottoms. The supply pipe by which the gas mixture or the desorbent is supplied to the bottom of the tank is equipped with a blower and a three-way valve which alternately admits the gas mixture and the desorbent into the tank. During the regeneration period, the gas mixture still remaining in the adsorption tank is expelled by the desorbent (air) back into the enclosure; the desorbent is then discharged to the atmosphere. The system of valves with a pre-set time delay can be automatically operated either electrically, pneumatically, mechanically, or hydraulically. A second modification employs two tanks so connected that adsorption takes place in one tank while regeneration goes on in the other.

17359 APTIC NO. 35889

Schwan, Ruediger

NOVEL FILTER MEDIUM FOR DRY DUST COLLECTION. *(Neuartiges Filtermedium fuer die Trockenentstaubung). Text in German. Staub, Reinhaltung Luft, 31(11):439-443, Nov. 1971.*

In the past ten years, acicular felts have come increasingly into use as filtering media in cloth filters. The thicker acicular felts with a denser fiber distribution are capable of retaining more dust. The life-time is not shorter than that of the conventional filters and the collection efficiency is higher than 99%. A new type of acicular felt filter has been developed. Its surface which faces oncoming gas flow is very smooth, elastic, and hydrophobic. The critical surface tension of the filter lies between 17.5 and 19 dyn/cm. The side facing the oncoming flow resists long-term temperatures of around 200 C. It is also very cold resistant. Despite the hydrophobic properties of the filter surface, the water vapor permeability is relatively high. The friction coefficient of the surface is extremely low at all temperatures. The uninterrupted exposure to hot water vapor lowers the temperature resistance. Water, water vapor, or an occasional drop below the dew point have a negligible influence on the filter. As a result of these surface properties, most of the dust is retained on the surface, making cleaning of the filter simple. The good filter characteristics found in the laboratory have been confirmed in practice in a metal soap plant.

17360 APTIC NO. 35836

Seim, Edwin Charles

SULFUR DIOXIDE ABSORPTION BY SOIL. *Minnesota Univ., Minneapolis, Dept. of Soil Science, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1970, 138p. 181 refs.*

Sulfur dioxide absorption by the soil was examined with respect to the magnitude and mechanics of the process, sulfur economy of the soil, and the removal of SO2 from polluted air. Significant absorption occurred when SO2 laden air passed over five samples of silt and loam. Significant amounts were absorbed by dry and moist soil. Greatest absorption was determined in the top two cm layer of soil and virtually all absorption occurred in the upper four cm of exposed soils. Removal of SO2 from the air stream was 61-100% of the incoming SO2 concentration. No SO2 was found in the exposed soil but large increases in sulfate were determined. Although all soils absorbed sulfur when exposed separately, absorption was not uniform when the soils were exposed simultaneously; the soil initially highest in sulfur established the lowest relative increase in sulfur after exposure. The deposition velocity averaged 0.2 cm/sec and was relatively constant for all of the soils, SO2 concentrations, and moisture levels tested. (Author summary modified)

17361 APTIC NO. 35790

Seki, Michiharu

STACK GAS DESULFURIZATION BY ADSORPTION. *(Kyuchakuho ni yoru haien datsuryu). Text in Japanese. Kagoku Kogaku (Chem Eng.), 35(12):1274-1278, Dec. 1971. 6 refs.*

The development of a desulfurization technique using activated carbon for the thermal plant boiler exhaust gas was discussed. Pilot plants of capacities 6000 N cu m/h and 150,000 N cum/h were tested between 1967 and 1969. Approximately one seventh of the total 150,000 N cu m/h gas was treated for a test. After dust was eliminated by an electrostatic precipitator, the gas was sent to the towers packed with activated carbon. Each of the five packed towere were separated into two chambers, and the gas flew through ten chambers simultaneously. Sulfuric acid formed on the carbon surface and was extracted by scrubbing in water; as soon as one tower was scrubbed for 12 hours, the next tower began scrubbing. The entire cycle for the five tower was 60 hours, and the adsorption time per tower was 48 hours. The adsorption capacity, adsorption speed, the speed of sulfuric acid separation, and other indexes are reviewed by tables and graphs. Performance tests were given to various carbons. Distilled carbon was made by treating for three hours in 700 C high nitrogen, and activated carbon was made by treating the distilled carbon for two more hours in vapor at 900 C. Both distilled and activated wooden charcoals showed the same amount of adsorption rate, but the adsorption capacity of mineral coal was greatly increased by the vapor treatment.

17362 APTIC NO. 35771

Senkevich, E. V.

CALCULATION OF A GAS COMBUSTION PROCESS USING EXHAUST AIR CONTAINING COMBUSTIBLE COMPONENTS. *(Raschet protsessa szhiganiya gaza s ispolzovaniyem otbrosnogo vozdukha, soderzhashchego goryuchiye komponenty). Text in Russian. Gaz. Prom., 16(6):37-38, 1971.*

A graphic method for the calculation of the afterburning of solvent-containing exhaust gas from paint driers with natural gas for air pollution prevention is presented. The driers may contain up to 25% (of the lower limit of explosion in admixture) of solvents such as toluene or xylene. Nomographs for the determination of the amount of the combustible pollutants in the exhaust air are given. Alignment charts expressing the variation of the true excess air coefficient and of the variation of the calculated excess air coefficient as affected by the concentration in combustible components in the exhaust air are developed.

17363 APTIC NO. 35744

Shidara, Masao

TREND OF DESULFURIZATION TECHNIQUES ON STACK GASES. *(Haien datsuryu gijutsu no tenbo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(12):1086-1097, Dec. 1971. 11 refs.*

Principles and actual examples of stack gas desulfurization methods are comprehensively discussed. The wet type desulfurization uses various absorbents such as ammonia, sodium carbonate, caustic soda, lime or dolomite, magnesia, potash, or various catalysts. There are more than ten representative dry type of desulfurization methods, including: adsorption by activated carbon, coke, active manganese dioxide, diethylamine, nitrogen dioxide, vanadium pentasulfide (contact oxidization), alumina, and various other methods which are identified by the principal developers. The chemicals required for various processes and the cost involved, by-products obtained, their cost, and their sale values are reviewed by tables. Whether a desulfurization system is economically feasible or not depends on the recovery of the by-product. Sulfur or sulfuric acid may be recovered from sulfur dioxide, ammonium sulfate may be obtained using ammonia as an absorbent, or sulfite, mirabilite, or plaster may be recovered by using alkali solution reactions. Sodium anhydride with high purity may also be obtained. Sulfur is overproduced at present, but demands for sulfuric acid are0 constantly rising. Mirabilite is much in demand, and plaster is very much in use as cement material and refractory material. The demand for ammonium sulfate is decreasing. The flow sheets for the methods for by-products recovery are presented.

17364 APTIC NO. 35566

Shieh, Wen-shong and Robert H. Essenhigh

EXPERIMENTAL BEHAVIOR OF WASTE COMBUSTION IN A TEST INCINERATOR. *Preprint, Delaware Univ., Newark, 31p., 1971. 20 refs. (Presented at* *the Mid-Atlantic Industrial Waste Conference, 4th, Newark, Del., Nov. 18-20, 1970.)*

Experiments on waste combustion in a test incinerator are examined with respect to incinerator design, instrumentation for analysis and determination of emissions, operational procedures, and results. Smoke, fly ash, and odoriferous or noxious gases were emitted in the process. The countervortex system of overbed air supply was capable of generating a stirred-reactor flame-holder for the overbed flame, which could be maintained only above some minimum rate of fuel and air supply. The fuel for the overbed flame was mainly a product of pyrolysis. When the overbed flame was absent, the prime source of heat for pyrolysis was the convective heating from the bed. When air rich was burned, the overbed flame was clean, but when fuel rich, it emitted smoke. With a sufficiently hot overbed flame, radiation alone would be sufficient for total pyrolysis, thus minimizing fly ash emissions. (Author conclusions modified)

17365 APTIC NO. 35755

Shishkov, D., D. Ivanov, and G. Radoyeva

APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS IN STUDYING THE REGENERATION PROCESS OF A LOW-TEMPERATURE CATALYST UTILIZED FOR THE CONVERSION OF CARBON MONOXIDE. *(Issledovaniye protsessov vosstanovleniya nizkotemperaturnogo katalizatora dlya konversii okisi ugleroda metodom differentsialnotermicheskogo analiza). Text in Russian. Zh. Prikl. Khim., 44(9):1947-1951, 1971. 8 refs.*

The kinetics of the regeneration of copper containing low-temperature catalysts utilized for the conversion of carbon monoxide were investigated by determining the differential temperature variations and the amounts of generated carbon dioxide captured in a barium hydroxide solution. Determinations were carried out with pure nitrogen (as a gas carrier) to which 2.8% CO was added (as a reducing agent for the regeneration of the catalyst) at 100, 125, 150, 175, 200 and 400 C temperatures. Two catalysts, A (including 5 CuO CuCr 204 (copper oxide copper chromate) as the copper containing catalyst to be reduced) and B (including CuO as the copper compound to be reduced) were investigated. Differential and kinetic diagrams of the reducing process with CO are reproduced. Two exothermal peaks were observed within the 0-400 C temperature range, indicating that this reduction process occurs in two stages as in the reduction with hydrogen utilized as a reducing agent. The rate of catalyst regeneration at low temperatures appeared to be higher by utilization of CO than by application of hydrogen as a reducing agent.

17366 APTIC NO. 35330

Shlyapnikov, V. A. and S. S. Shraibman

PURIFICATION OF GASES FROM ELECTROCHEMICAL PRODUCTION OF CHLORATES. *(Ochistka electrolitnykh gazov khloratnogo proizvodstva). Text in Russian. Khim. Prom. (Moscow), 47(9):684-687, 1971.*

Removal of chlorine from gases produced by electrochemical sodium chlorate manufacturing can be achieved by absorption with alkali or sodium carbonate solutions in a sequence of three columns provided with a countercurrent flow. Experiments were carried out with electrolytic alkali solutions containing 60-80 g/l sodium hydroxide, with caustic soda solutions containing 100-130 g/l of NaOH, with soda solutions containing 140-160 g/l of sodium carbonate and with alkali and thiosulfate containing solutions. The first experiment lasted 64 hours whereby a 50 g/l concentration of sodium hypochlorite was obtained in the first column. Absorption of carbon dioxide occurring simultaneously produced a 100 g/l of sodium carbonate formation in the first absorber. The concentration of active chlorine was 1.0 g/l in the second absorption column, indicating that the bulk of chlorine was practically removed within the first absorption column. The second experiment lasted 98 hours and produced 70 g/l concentrations of sodium hypochlorite and of 7 g/l of sodium chlorite in the first column. The active chlorine concentration was of 0.7 g/l upon entering the second column. The third experiment (utilizing Na_2CO_3 for chlorine absorption) led to almost complete chlorine absorption within the first column. The thiosulfate method produced similar results. The absorption temperature within the first and second columns ranged between 26 and 32 C in all experimental cases. The third column was utilized for the removal (with water) of the absorbing agent traces. The water contained approximately 1 g/l of carbon dioxide at the end of the washing process. The first two columns of the system appeared to provide complete removal of chlorine from gases produced by the electrochemical manufacturing of sodium chlorate.

17367 APTIC NO. 35720

Shriner, Walter

AIR POLLUTION REDUCTION SYSTEM. *(Assignee not given.) U. S. Pat. 3,587,210. 7p., June 28, 1971. 18 refs. (Appl. May 2, 1969, 13 claims).*

An air pollution reduction device for placement in the path of a pollutant-loaded stream of hot gases, e.g., exhaust from an internal combustion engine, comprises a tubular body with four compartments, each with a baffle formed of a dielectric plastic material and a fiber-glass or aluminum filter. The baffles induce electrostatic forces that cause precipitation of the solids and their discharge to the entrapment zones. The system is an improvement over similar systems in that the electrostatic charges applied to particles in the fluid stream are intensified by openings in the dielectric walls. These effectively coalesce electrostatically precipitated particulate matter and enhance removal of very fine colloid particles that are especially conducive to smog formation.

17368 APTIC NO. 35528

Sigg, Conrad

PROCESS AND DEVICE FOR THE COOLING OR CONDITIONING OF GASES. *(Verfahren und Vorrichtung zum Kuehlen oder Koditionieren von Gasen). Text in German. (Assignee not given.) Swiss Pat. 496,933. 2p., Sept. 30, 1970. (Appl. July 17, 1968, 2 claims).*

A method of cooling dust-laden waste gas from cement plants, incinerators, and metallurgical and other furnaces is described which accomplishes the cooling or conditioning effect by injecting water through one or more spray nozzles in the direction of the gas flow in a cooling or conditioning chamber. The injected water is preheated by the gas to be cooled to a temperature which at least equals the saturation temperature prevailing in the conditioning chamber but does not exceed the temperature of the gas to be cooled. The cooling effect is accomplished by the withdrawal of the evaporation heat from the gas. The water should be injected in a venturi-shaped part of the chamber where the gas attains a velocity of at least 10 m/sec.

17369 APTIC NO. 35056

Slack, A. V. and H. L. Falkenberry

SO_2: MORE QUESTIONS THAN ANSWERS. *Elec. World, 176(12):50-54, Dec. 15, 1971.*

Recent legislation will require the electric power industry to reduce sulfur oxide emissions at many power stations. This is likely to involve installation of stack gas treating equipment -- although there are other ways of handling the problem, removing the sulfur dioxide from the stack gas is the nearest to demonstrated feasibility. Research and development progress concerning removal methods is reported and assessed for the Tennessee Valley Authority. Catalytic oxidation, magnesia scrubbing, sodium scrubbing, copper oxide sorption, molten salt technology, and carbon adsorption are mentioned. Ammonia scrubbing and lime-limestone scrubbing are described. Pilot plant projects are indicated, as well as the cost of limestone scrubbing.

17370 APTIC NO. 35742

Smith, Peter W.

FILTER AND FILTER ASSEMBLY. *(Assignee not given.) U. S. Pat. 3,581,478. 8p., June 1, 1971. 6 refs. (Appl. Feb. 20, 1969, 3 claims).*

An air or gas filter for ventilating systems is composed of a rectangular panel with a peripheral rim that projects outward and lies parallel to the direction of gas flow. The rim is seated on a strip of sponge rubber or plastic foam and held in position with light pressure to form a seal preventing the bypassing of unfiltered air. Strengthening pieces placed obliquely across opposite corners of the frame also serve as handles facilitating removal or fitting of the panel. Several panels can be combined into a supporting lattice structure by means of channel-section material pushed into sockets in joint members. Resilient seatings in the channels make airtight joints, and quick-release clamps retain the panels in the lattice.

17371 APTIC NO. 35688

Sorem, S. S.

EFFECTS OF FUEL FACTORS ON EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York; American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Inst. of Chemical Engineers, New York; and American Society of Mechanical Engineers, New York, 9p., 1970. 34 refs. (Presented at the Bay Area Air Pollution Symposium, Menlo Park, Calif., Sept. 21-22, 1970, Paper 710364.)*

Possibilities for reducing automobile emissions through changes in gasoline composition are discussed. Small benefits are achievable by limiting front-end volatility and light olefin content; California has already passed legislation limiting these fuel properties. Fuel hydrocarbon type, octane number, and lead antiknock content are interrelated. Maintenance of octane number while removing lead can be achieved by increasing aromatic content, but with a resulting increase in exhaust reactivity. Alternatively, lead can be removed without changing hydrocarbon composition if engine octane number requirement is reduced. While these changes may reduce exhaust hydrocarbons, they will lower engine efficiency, and thus increase exhaust flow rates. The net effect on pollutant emissions is in doubt. Gasoline additives, other than lead, have little direct effect one engine exhaust. They do perform functions that minimize the deterioration of engine emission characteristics. (Author abstract modified)

17372 APTIC NO. 35848

Spedden, H. R.

IMPACT OF ENVIRONMENTAL CONTROLS ON NON-FERROUS METALS EXTRACTION. *Mining Congr. J., Dec. 1970, p. 57-62. 20 refs.*

The impact of environmental controls on extractive metallurgy will be found in a stimulated effort to carry a number of concepts of sulfur control to the point of economical application. The near-term effort will see a rapid proliferation of sulfuric acid plants on high-strength sulfur dioxide gases supplemented by processes designed to alleviate the discharge of low-strength gas. Concurrently, smelter process modifications will be made to reduce the quantity of nitrogen used in combustion air and thus produce a more easily controlled high-strength gas. Further development of new smelting methods should enable the industry to install its needed new capacity while concurrently lowering sulfur emissions. Ultimately, the control of sulfur in processing sulfide mineral concentrates may be achieved through hydrometallurgical processes such as roast-leaching, pressure leaching, partial distillation of sulfur, and low-temperature chemical oxidation.

17373 APTIC NO. 35625

Staeger, Hans

TREATMENT OF DUST, SMOKE, AND AIR. *(Staub-, Rauch-, Luftbehandlung). Text in German. Schweiz. Tech. Z., 66(32):645-659, Aug. 7, 1969; 66(33):665-680, Aug. 14, 1969; 66(34):697-714, Aug. 21, 1969. 21 refs.*

The origin and morphology of dust and smoke and various systems of air purification, particularly filtration and filter design are reviewed. Dust can be formed by dispersion of fine particles from the land surface or as a result of human activities. Smoke is an aerosol containing solid, dispersed particles formed by chemical processes or by condensation and sublimation of highly dispersive substances. To characterize aerosols it is necessary to examine the morphology of the solid particles, including the outer and inner surfaces by such techniques as optical and electron-optical observation, adsorption, and desorption. Among available methods for determining the crystal structure of solid bodies are X-ray and electron diffraction. Particle size, distribution and dispersiveness are also important. Among methods for removing solids from air, the most widely used is filtration, employing various filtering arrangements with electric fields and filters made of either natural or synthetic, inorganic or organic materials. When used in connection with technologic processes, filters must be precisely characterized and adequately tested prior to installation. Radioactive dusts require special methods of treatment.

17374 APTIC NO. 35882

Stettenbenz, L. M.

BENEFITS OF THE POWER-RECOVERY GAS EXPANDER. *Chem. Eng., 79(1):93-96, Jan. 10, 1972. 7 refs. (Presented at the American Society of Mechanical Engineers, Petroleum Mechanical Engineering with Underwater Technology Conference, Houston, Tex., Sept. 19-23, 1971, Paper 71-Pet 11.)*

Power recovery from high-pressure, effluent process gases by means of gas expanders was introduced in industry more than a decade ago in an attempt to alleviate the cost-profit squeeze. As design and operation methods improved, the technique has come to be recognized also as an efficient way of combating air pollution. Expanders of the methane and catalytic-cracking cycles are essentially single or two-stage cantilever units, equipped with axial inlets that operate on low inlet pressures and high flows. By contrast, the nitric acid process expander has three to five stages, is straddle-mounted, and has a 90-deg angle inlet. It is designed for low flows and high inlet pressures. The methane, nitric acid, and catalytic-cracking cycles are described, with special reference to economic considerations and pollution control of entrained particles.

17375 APTIC NO. 35647

Strauss, W.

THE DEVELOPMENT OF A CONDENSER FOR ODOR CONTROL FROM DRY RENDERING PLANTS. *J. Air Pollution Control Assoc., 14(1):424-426, Jan. 1964. 2 refs.*

Odors from a rendering plant were virtually eliminated by a condensing plant followed by a carbon filter. The condensing plant consisted of a surface vapor condenser with a water-cooling tower and equipment with lower combined capital and operating costs than direct spray or air-cooled fin tube condensers. The specification for the plant required that water vapor at an average maximum rate of 1250 lbs/hr be condensed, and nonvolatile gases be cooled to about 125 F before being passed through a carbon adsorber, as carbon becomes ineffective above this temperature. A special feature of the specification stressed the corrosive nature of the gases (e.g., di-and triethylamine) and the requirement for corrosion-resistant materials. Originally mixed with atmospheric air, noncondensables were now passed though a series of fin-coils. The cooling tower was a forced draft counterflow design with high-density polyethylene packing. Tubes were galvanized mild steel with treated steel plate casings. No signs of corrosion were apparent after several months operation.

17376 APTIC NO. 35336

Stump, William W.

METHOD AND APPARATUS FOR INDUCTIVELY CHARGING A FILTER OF COMBINED METAL AND DIELECTRIC MATERIAL FOR COLLECTING NORMALLY CHARGED AIRBORNE PARTICLES. *(Assignee not given.) U. S. Pat. 3,581-462. 9p., June 1, 1971. 10 refs. (Appl. Dec. 23, 1968, 13 claims).*

Monocharging a filter consisting of electroconductive and nonconductive collecting surfaces with an inductive field supplied from a low frequency pulsating direct current voltage would attract and collect normally charged particles. The inductive filter charging field permits the use of a metal plate (grid filter or monocharged filter) of highly insulative materials, including paper, plastics, open cell foam, or plastic screen to be charged by a grid conductor. Metal plates, shavings, wools, wire screens, and grids inductively charged distribute the monocharge of low voltage low frequency over their own surfaces as well as the insulating or dielectric portions of the filter. (Author abstract modified)

17377 APTIC NO. 35047

Suzuki, G., K. Morikawa, and S. Suzuki

MANUFACTURING METHOD OF HIGHLY ACTIVE PALLADIUM-CARBON CATALYST. *(Kokassei parajiumu-kasseitan shokubai no seizoho). Text in Japanese (Assignee not given.) Japan. Pat. Sho 46-22444. 3p., June 26, 1971. (Appl. July 5, 1966, 1 claim).*

A method of producing extremely active palladium-carbon catalyst for hydrogenation is described. An active carbon of 200 mesh was soaked in a 10% hydrofluoric acid water solution for one month, and impure materials such as metal ash and silicate were eliminated. It was then washed thoroughly in ion exchange water and dried for four hours at 110 C. Two grams of the active carbon were suspended in the ion exchange water. A solution of palladium salt was added until the palladium content was five weight percent. After palladium was evenly adsorbed by the carbon, the carbon was washed thoroughly in the ion exchange water until the waste water showed no sign of chlorine ion.

17378 APTIC NO. 35535

Szczeniowski, Boseslaw

THE PROBLEM OF LEADED GASOLINE. *Eng. J. (Montreal), 54(11):22-24, 27, Nov. 1971. 21 refs.*

Redesigning the engine for lower compression ratios does not appear to be the best approach to the problem of tetraethyl lead in gasoline. Tetraethyl lead, in which there is about 64% lead by weight, is the most effective antiknocking agent discovered to date. The most effective substitute antiknock substance among liquids that may be contemplated as an additive to gasoline with practical hope is ethanol, more than twice as effective as benzene. Moreover, experience has shown that the addition of ethanol to gasoline reduces combustion chamber deposits concurrently. The problem of avoiding the use of tetraethyl lead in fuel is considered, as well as the conflicting opinions of the industry and researchers involved.

17379 APTIC NO. 35289

Takahashi, Satoru

EXHAUST GAS CLEANING DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Suzuki Jidosha Kogyo Kabushiki Kaisha Kaminura, Hamana-Gun (Japan)) U. S. Pat. 3,590,579. 20p., July 6, 1971. 6 refs. (Appl. June 12, 1968, 2 claims).*

A spark plug is caused to spark at a point in the exhaust passageway immediately downstream from the exhaust port of each cylinder of an engine immediately after full closure of the exhaust port during the compression stroke, thus ensuring complete combustion of what fuel-air has been unavoidably blown past the exhaust port before full closure of the port. A small quantity of supplementary fuel-air mixture can be supplied as pilot gas with or without supplemental air to the spark gap to facilitate and ensure positive ignition and combustion. Other refinements include a precombustion chamber around the spark gas and control devices for causing the pilot gas to be supplied only when this supply of pilot gas is advantageous. (Author abstract modified)

17380 APTIC NO. 35719

Takahashi, Shigezo

PROBLEMS IN PUBLIC NUISANCE CONTROL PLANS. *(Kogai boshi keikaku sakuteijo no mondaiten). Text in Japanese. Taiki Osen Kenkyu (J. Japan Society Air Pollution), 6(1):42, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct.27-29, 1971.)*

As a large scale pollution control plan for Kanagawa prefecture, the establishment of a monitoring system is the primary concern. This is to be achieved by a wider installation of monitoring apparatus, which will lead to securing of a broader-area control, a better prediction system, and more effective emergency treatment. Fourteen monitoring locations in Yokohama and Kawasaki cities have been automated by telemeters and 52 more locations will be automated in the future. The general public is encouraged to inform the monitoring agencies concerning pollution cases. However, more complete and basic control methods will require a tremendous fund, and a truly effective control plan could be realized only with the subsidial policies of the national government.

17381 APTIC NO. 35298

Tamura, Zensuke and Yukio Hishinuma

SULPHUR DIOXIDE EXTRACTION BY CHARCOAL ABSORPTION. *(Verfahren Desorption einer Aktivkohleadsorptionszone). Text in German. (Hitachi, Ltd., Tokyo (Japan)) W. Ger. Pat. DAS 1,619,880. 6p., Sept. 9, 1971. (Appl. Sept. 20, 1967, 2 claims).*

Sulfuric acid is obtained in an adsorption system containing three beds alternating between adsorption, washing, and drying. Thus, sulfur dioxide-containing gases are desulfurized in the charcoal bed, eluted from the beds by a wash procedure, and the resultant dilute acid is concentrated in a flash evaporator and the water is recirculated.

17382 APTIC NO. 35087

Taylor, Donald H.

RECOMMENDATIONS FOR DUST COLLECTION SYSTEMS. *Metal Progr., 98(6):63, Dec. 1970.*

Recommended design criteria are presented for dust collection systems to ensure ultimate efficiency, economy, and control. The components of a dust collection system include a hood to control dusting material at the source; ductwork to convey dust-laden material or gas to the collector; a prime mover, e.g., fan or compressed air; provisions for collection and separation of dust from gas; provisions for release of gas to the atmosphere, building, or for return to the process; and final disposal of collected material, e.g., dumping.

17383 APTIC NO. 35070

Thompson, B. W. and W. Strauss

THE APPLICATION OF VORTEX THEORY TO THE DESIGN OF CYCLONE COLLECTORS. *Chem. Eng. Sci., vol. 26:125-131, Jan. 1971. 12 refs.*

A study of the passage of dust particles through a cyclone collector using the Stokesian model of viscous drag determined two scales associated with the motion: a short time, proportional to viscosity, during which the particles acquire a small velocity defect, relative to ambient gas, thus providing a frictional drag that roughly balances the inertia of spiral motion, and a much larger time, inversely proportional to viscosity, in which the residual imbalance causes the particles to drift to the wall. Theoretical extraction times agreed with experimental results for particle sizes up to five micron. (Author abstract modified)

17384 APTIC NO. 35756

Tikhonov, N. V., R. V. Malov, V. V. Tsarev, and A. S. Chaykin

REDUCING AIR POLLUTION FROM MINING EXPLORATION WITH DIESEL ENGINES. *(O snizhenii zagryazneniya atmosfery gornorazvedochnykh vyrabotok otrabotavshimi gazami dizelnykh dvigateley). Text in Russian. Izv. Vyssh. Ucheb. Zaved., Geol. Razved., 14(7):116-120, 1971. 5 refs.*

The utilization of diesel engines in mining exploration is limited by the toxicity of their exhaust gases containing large amounts of nitrogen oxides and aldehydes. One of the main means to reduce nitrogen oxides emissions is the decrease of the fuel feeding slope of the engine. Adsorptive neutralization of nitrogen oxides by means of synthetic zeolites appears to be economical and effective. In liquid neutralizing, 10% sodium sulfite solutions with 0.5% additions of hydroquinone, 7.0% potassium permanganate solutions, or 10.0% ferrous sulfate solutions appear to be effective for the reduction of aldehyde emissions.

17385 APTIC NO. 35893

Trauffer, Walter E.

KENTUCKY STONE CO. S NEW DUSTLESS STONE PLANT. *Pit Quarry, 64(6):70-75, Dec. 1971.*

When it became apparent that air pollution regulations could not be met with the existing control system, a new and larger crushed stone plant was constructed. The new plant is located well back from the road at a site where it is barely visible and cannot be heard. It has greater capacity and flexibility and a much improved dust collection and suppression system. The primary crusher was put in the high-calcium limestone quarry at the second of its four levels, resulting in little uphill haulage and a maximum haul of 2000 ft. A feature of this operation is the use of a completely-enclosed surge storage silo. The dust control system comprises baghouse filters specially designed duct work, dust collectors, fans, wet chemical dust suppression systems, hoods, and various enclosed areas. Plant design is described.

17386 APTIC NO. 35304

Truitt, J. and R. J. Davis

THE FUNCTION OF CONDENSING STEAM IN AEROSOL SCRUBBERS. *Am. Ind. Hyg. Assoc. J., 32(9):583-592, Sept. 1971. 14 refs.*

An investigation was undertaken to determine the effects of particle concentration, water condensation rate, particle size, and particle substance on the removal efficiency of an experimental condenser scrubber. The experimental device was a vertically oriented, watercooled, four inch diameter pipe; aerosols of metal oxide particles plus steam were admitted to the bottom. Measurements of particle number concentration and size distribution were made. The data suggest that the water condensed on the particles, the latent heat of vaporization was released to the aerosol, and the particles were swept to the condenser wall by thermophoresis. Thus, a condensation scrubber which takes advantage of particle growth is economically feasible. (Author abstract modified)

17387 APTIC NO. 35839

Tsukahara, Minoru, Yutaka Yoshida, and Mitsuru Akagi

STUDY ON COMBUSTION GAS FROM A PREDETERMINED AMOUNT OF COMBUSTION (I), EFFECT OF THE WALL TEMPERATURE AND THE PRESSURE OF AIR-FUEL MIXTURE ON FORMATION OF EXHAUST GAS. *(Teiyo nensho ni okeru nensho gasu no kenkyu (I). Haiki gasu sosei ni oyobosu nenshoshitsu hekion to kongokiatsuryoku no eikyo). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Hokkaido Branch, p. 283-286, 1971. (Presented at the Japan Society of Mechanical Engineers, Hokkaido Branch, Lecture Meeting, 15th, Sapporo, Japan, Oct. 31, 1971.)*

The composition of engine combustion gas is influenced by a number of factors such as the air-fuel ratio, compression ratio, the shape of the combustion chamber, ignition timing, or muffling of the flames. Using a model combustion vessel, the effects of various air-fuel ratios, wall temperatures, and combustion pressures on the composition of hydrocarbons, carbon monoxide, and carbon dioxide were examined. Hydrocarbon composition was compared with the results of previously published data, and various influences were clarified by separating components. Under any pressure, when the air-fuel ratio approached from rich to the theoretical ratio, the concentration of HC was reduced drastically. When the air-fuel ratio was lean, HC was level or slightly increased. Under any pressure, CO decreased proportionately from rich to air-fuel ratio 18 The highest CO_2 concentration was noted near the theoretical ratio. In any air-fuel ratio, the pressure had no effect on the composition of the exhaust gas. With regard to the combustion pressure, the highest figure appeared near the theoretical air-fuel ratio and decreased on both sides. The influence of the air-fuel ratio was greatest on HC emission, then the combustion pressure, and lastly the temperature of the wall. These findings corresponded with the previously published data, but when the air-fuel ratio was rich, HC was increased drastically as the wall temperature became lower.

17388 APTIC NO. 35054

Tsushima, Yoshio

FIRST JAPANESE-MADE SULFUR DIOXIDE RECOVERY PLANT OF THE WELLMAN- LORD PROCESS. *Chem. Economy Eng. Rev., 3(11):21-24, 32, Nov. 1971.*

Trial operation of the first Japanese-made Wellman-Lord sulfur dioxide recovery plant is discussed. Flue gas containing SO_2 is washed by a pre-scrubber installed in the lower part of the absorption tower, and the greater part of solids and sulfur trioxide in the gas are removed and discharged with the waste water. The clean gas rises in the tower and contacts a countercurrent of an absorbing solution of concentrated sodium sulfite, which eliminates more than 90% of the SO_2. From the desulfurized gas, droplets are completely removed by the demister in the upper part of the absorption tower. The gas is discharged at about 60 C. The absorbent discharged from the absorption tower is stored in a tank, and then sent to the evaporator. In the evaporator, the sodium bisulfite solution is heated with steam and decomposed into SO_2 gas and sodium sulfite The SO_2 leaving the evaporator together with steam is converted to 90% SO_2 gas in the cooler where the steam is condensed. Sodium sulfite is gradually concentrated and crystallized. A contact sulfuric acid plant, wastewater treatment, the afterburner, start-up, and operating conditions are discussed.

17389 APTIC NO. 35080

Uchida, Sanichiro

UNLEADED GASOLINE PROBLEMS. *(Gasorin no muenka ni tsuite no mondaiten). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 50(534):768-777, Oct. 1971. 20 refs.*

In Japan, all the lead additives in both premium and regular gasolines are to be removed by April 1, 1974. This will present both technical and economic problems for the refineries, as they seek a suitable octane booster. The manufacturing industry faces problems of valve seat recession and knocking troubles with the older cars. (Author summary modified)

17390 APTIC NO. 36008

Ueda, Hisashi and Naoyuko Todo

AN ESR STUDY OF AN AL203-M003-C00 CATALYST IN A SYSTEM WITH H2 AND THIO-BETA-NAPHTHOL. *(H2, thio-beta nafutoru, arumina-sanka moribuden-sanka kobaruto shokubai-kei no ESR-ho ni yoru kenkyu). Text in Japanese. Tokyo Kogyo Shikensho Hokoku, 66(11):418-425, Nov. 1971. 11 refs.*

An investigation was undertaken to determine the reaction mechanism of the catalytic desulfurization of organic sulfur compounds on the surface of alumina-molybdenum trioxide-cobalt oxide particles. The experimental method consisted of electron spin resonance measurements, by means of which the paramagnetic species on the surface of Al203, Al203-Mo03, and Al203-Mo03-Co0 in the presence and absence of hydrogen and thio-beta-naphthol were studied. Several artificial reaction systems were investigated in which either one of the reactants, catalyst components, or reactions conditions (e.g., temperature) were deficient. In such deficient systems, the reaction cycle is cut off and some intermediates are expected to accumulate. The observed paramagnetic species are indicated.

17391 APTIC NO. 35785

Uozumi, Sutekiyo

CONTROL OF CARBON GASES IN CENTRAL AIR CONDITIONING. *Preprint, Dept. of Commerce, Washington, D. C. and the Water Pollution Control Federation, Washington, D. C., 3p., 1971. (Presented at the Technical Conference on New Technology in the Solution of Practical Problems on Air and Water Pollution Control, Tokyo, Japan, Dec. 8, 1971.)*

Because city codes require that outside air be brought in for recirculation, air in buildings with the best filters and air conditioning is often polluted. Filters, including charcoal, are not effective for low carbon gases such as carbon monoxide and carbon dioxide. Moreover, air-conditioning systems tend to increase positive charges in air, thus maintaining the air pollution. Negative ionizers, or air chargers, offer an efficient way of reducing or eliminating smog and low carbon gases, which are positive electrically.

17392 APTIC NO. 35543

Uspensky, V. A., V. I. Soloviev, and V. S. Guriev

THE STUDY OF VELOCITY FIELDS IN A VORTEX DUST COLLECTOR. *(Issledovanie noley skorostey v vixrevom pyleulavlivayushchem appavate). Text in Russian. Nauk. Tekh., 20(6):1078-1081, June 1971. 3 refs.*

The existence of radial and ascending currents in the working cavity of a vortex apparatus has been found and explained experimentally. Some practical recommendations for the design of effective vortex dust collectors are made. Changing the velocity components of the gas flow can effect the efficiency of this wet cyclone. (Author summary modified)

17393 APTIC NO. 35650

Viessman, Warren

CAUSE AND CONTROL OF ODOR IN AIR CONDITIONED SPACES. *Air Cond., Heat., Ventil., vol. 56:77-81, Sept. 1959.*

Obnoxious odors in enclosed spaces include tobacco smoke odors, chemical and product odors, odors introduced from the outside atmosphere, and odors from air conditioning coils. To keep odor perception and irritation at a minimum, air conditioning spaces should be designed for about 50-55% relative humidity. Temperature can generally be ignored since it has slight effect on odor level at constant specific humidity. Ventilation and charcoal adsorption are effectively and extensively used in air conditioning for odor removal by engineers. In ventilation, air containing objectionable gaseous odors, irritants, particulates that obscure vision, and toxic matter are replaced by clean fresh outside air. Ventilation requirements for human occupancy are a function of space person and the activity. An Activity Curve is given for determining the requirements for various conditions. At air temperatures below 125 deg, odors, vapors, and gases (except carbon monoxide or carbon dioxide) are effectively removed by charcoal adsportion. Carbon requirements can also be determined from the Activity Curve. Exhaust gases between 125-500 deg can be destroyed by catalytic combustion at 500 deg. For higher temperature gases, direct combustion at 1200 deg is employed. Tests were made on odor adsorption and release in an enclosed space. Methods for measuring odor intensities were discussed.

17394 APTIC NO. 35716

Vigil, Julio S.

CONCENTRIC ANNULAR VENTURI GAS SCRUBBER. *(Chemical Construction Corp., New York) U. S. Pat. 3,584,440. 7p., June 15, 1971. 4 refs. (Appl. March 19, 1969, 18 claims).*

An improved venturi scrubber accomodates large volumes of gas at a lower pressure drop, completely and uniformly scrubs the gas stream, and is readily assembled from standard components and materials. The apparatus features two concentric annular venturi passages for gas-liquid contact. These are provided within a vertically oriented container by concentrically disposing a central conical baffle, an annular ring-shaped circular baffle having an angular projection, and an outer inverted frustoconical baffle. The baffles are spaced apart to form the two annular scrubbing passages that insure uniform scrubbing of large volumes of gas with low pressure drop loss. Applications of the invention include scrubbing of waste gases and scrubbing of process gas streams in chemical and metallurgical processes.

17395 APTIC NO. 35851

Vincent, J. H.

EVALUATION OF A LIGHT TRANSMISSION TECHNIQUE FOR TESTING A TWO-STAGE ELECTROSTATIC DUST PRECIPITATOR. *Brit. J. Appl. Phys., 4(11):1835-1842, Nov. 1971. 11 refs.*

A light transmission technique was used to evaluate the performance of a two-stage electrostatic dust precipitator, with fly ash as the test dust. Collection efficiency of the second stage was obtained in terms of the surface area of the dust as a function of the applied voltage. The technique was limited when the mean particle diameter became of the same order of magnitude as the wavelength of the light. Semiquantitative assessments were calculated with respect to the behavior of the particle extinction coefficient in that regime. Results of testing with white light were compared with efficiency values obtained in terms of dust weight by isokinetic sampling. (Author abstract modified)

17396 APTIC NO. 35291

Wackernagel, Rudolf

METHOD FOR REMOVAL OF HYDROGEN SULFIDE FROM HYDROCARBON CONTAINING GASES. *(Uhde (Friedrich) G.m.b.H, Dortmund (West Germany)) U. S. Pat. 3,590,555. 5p., July 5, 1971. 3 refs. (Appl. Dec. 6, 1968, 4 claims).*

A method is described for the removal of hydrogen sulfide from hydrocarbon-containing gases by means of pressure washing. The esters of phosphonic acid and the derivatives of these esters are particularly suitable for this purpose, since they are very stable, in addition to having a low vapor pressure and low viscosity. The charged solvent is released under pressure and the intermediary expansion gas is conveyed back to the absorber after compression. The desorption heat expended in the regeneration is partially or entirely removed from the scrubbing compound, the fully regenerated solution is cooled by an heat exchanger. (Author abstract modified)

17397 APTIC NO. 35297

Walker, Brooks and Fred Volney Hall

EXHAUST SYSTEM. *(Auspuffanlage fuer Vergaser-Brennkraftmaschinen mit Entgiftungseinrichtung). Text in German. (Assignee not given.) W. Ger. Pat. DAS 1,476,645. 9p., Sept. 2, 1971. 7 refs. (Appl. Aug. 9, 1966. 2 claims).*

An exhaust system for an internal combustion engine is described, which has a purifier and control connected via a regulator to the carburetor throttle flap, so that a greater proportion of the exhaust gas flows to the purifier as the opening of the flap is reduced. Preferably the regulator comprises a force amplifier to utilize engine suction pressure.

17398 APTIC NO. 35738

Warren, Robert C. and Robert G. Adams

OVERHEAD VALVE ACTION AND AIR POLLUTANT DEVICE. *(Assignee not given.) U. S. Pat. 3,589,346. 6p., June 20, 1971. 10 refs. (Appl. May 6, 1969, 4 claims).*

Currently, all internal combustion engines used in motor vehicles utilize a series of poppet valves to permit entrance of a fuel-air mixture to a cylinder and exhaust of combustion products from the cylinder following ignition. The poppet valve is actuated by a horizontally extending rocker arm which imparts a horizontal load on the valve stem. This in turn causes a wear situation between the stem and its guide that results in the burning of nonchemically correct mixtures in the cylinders and increased hydrocarbon emissions. Of the two methods of combating wear, the mounting of a roller on the end of the valve stem increases the reciprocating weight of the valve-actuating mechanism. The second method -- conversion of the actuating mechanism to a pull system -- is extremely complicated and expensive. A simple and economical solution to the wear problem is to provide a guide installed concentric with the regular valve spring and stem. The pushrod for the guide is mounted coaxially with the valve stem. This motion-transmitting guidy takes up any horizontal force normally transmitted to the valve stem and comes in an easily replaceable unit which does not substantially add to the reciprocating weight of the actuating mechanism.

17399 APTIC NO. 35325

Weber Klaus, Erwin Becker, and Werner Grossstueck

PROCESS FOR THE MANUFACTURE OF SEPARATION NOZZLES AND THE SEPARATION NOZZLE MADE IN ACCORDANCE WITH THE PROCESS. *(Verfahren zum Herstellen von Trennduesen und nach dem Verfahren hergestellte Trennduese). Text in German. (Firma Klaus D. Weber, Pforzheim (West Germany)) Swiss Pat. 505,642. 10p., April 15, 1971. (Appl. Feb. 11, 1970, 2 claims).*

Separation nozzles used in the separation of gases or vapors of different molecular weights (such as two isotopes of one substance) are described. The separation nozzle has an outer metal mantle with a rounded depression into which protrudes one round-edged and one knifed-edged partition. The gas is fed into the separation nozzle under high pressure and is deflected around the rounded edge of one nozzle partition (of an extremely small curvature radius) towards the knife-edged second nozzle partition. The gas particles of heavier molecular weight are deflected to one side of the knife edged partion, while the lighter gas particles are deflected to the other side of the knife-edged partition. The separation efficiency of this nozzle, whose magnitude is of the order of a fraction of a mm depends entirely on extremely narrow tolerances. The manufacture of such nozzles are described.

17400 APTIC NO. 35515

Wetteborn, Wilhelm

A PROCESS FOR THE SEPARATION OF DROPLETS AND/OR OF FINE SOLID PARTICLES FROM A FLOW OF GAS. *(Verfahren zum Abscheiden von Fluessigkeitstropfen und/oder feinen Feststoffpartikeln aus einem Gasstrom). Text in German. (Koeckner-Humboldt-Deutz A. G. Cologne (West Germany)) Swiss Pat. 504,886. 4p., March 31, 1971. (Appl. March 10, 1970, 1 claim).*

The device intercepts droplets or solid fine dust carried by a gas stream by means of a row of parallel vertical partly overlapping lamellae placed at an angle to the gas stream in a gas duct. The off-stream edges of the lamellae are bent into vertical collection troughs which deliver the liquid or the solid phase to the bottom of the duct into a discharge arrangement. Discharge can be accomplished by overpressure in the gas duct. In the case of a liquid the separation efficiency of this arrangement increased considerably at a certain optimal distance between the lamellae. For complete separation of the liquid or of the solid phase, two rows of lamellae are needed with the second row deflected in orientation from the first row of lamellae by 20 to 60 deg. thus turning the flow of gas back into the direction of the gas duct axis. Gas flow velocity must exceed one m/sec. for the device to work.

17401 APTIC NO. 35314

Willett, Howard P.

REMOVAL OF OFF-GASES FROM OXYGEN STEEL CONVERTERS. *(Chemical Construction Corp., New York) U. S. Pat. 3,592,630. 14p., July 13, 1971. 7 refs. (Appl. May 3, 1968, 12 claims).*

A procedure is described for the removal of off-gas from an air-ventilated hood of an oxygen steel converter. Because a constant dry gas flow volume is maintained, the induction of excess ventilation air is prevented, and the system handles a minimum flow volume of gas. The formation of an inert gas plug or seal, during a period when the oxygen or carbon monoxide content of the gas mixture drawn from the hood is below the explosive limit, prevents the formation of an explosive mixture by separating the initial and final oxygen-rich gas flows from the carbon monoxide-rich gas flow at the peak of the blow period. Thus, the provision of an extraneous inert gas for off-gas flushing and ventilation at the spacing between the hood and the converter mouth is no longer a requisite. The control system is completely independent of the steelmaking operation. Additional advantages include recovery of unburned carbon monoxide, and more economical and compact gas handling equipment.

17402 APTIC NO. 35516

Woertge, Fritz Philipp

STACK ATTACHMENT. *(Schornsteinaufsatz). Text in German. (Assignee not given.) Swiss Pat. 496,921. 3p., Sept. 30, 1970. (Appl. Jan. 4, 1968, 1 claim).*

A stack extension is described designed to accelerate the velocity of flue gases. It is based on the fact that it is more effective to accelerate the flow of smoke than to facilitate the entry of the wind into the flue duct. The attachment consists of a square box with vertical side ribs protruding out from the four side walls of the box. The top of the box is a removable lid. The ribs (ducts) are tapered towards the outside and are slotted vertically to prevent the formation of turbulent flow which reduces gas flow velocity; the cutouts serve as wind guards which increase the dynamic pressure of the flue gases. The attachment can be assembled from formed pieces, thus eliminating all welding or riveting.

17403 APTIC NO. 35504

Woodward, Charles D. and Arthur P. S. Hyde

AIR PUMP FLOW CONTROL VALVE FOR ENGINE EXHAUST EMISSION CONTROL SYSTEM. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,591,961. 5p., July 13, 1971. 4 refs. (Appl. Dec. 18, 1969, 7 claims).*

Hydrocarbons and carbon monoxide in internal combustion engine exhausts can be reduced by an air injection reactor system. Since the air pump varies with engine speed, at higher engine speeds the air-fuel ratio is such that complete combustion occurs. Thus, additional air from the air injection system is not needed. The additional air can cause excessive exhaust system back pressure and power loss. Accordingly, an air pump flow control valve for use in an engine exhaust emission control system was developed. The new air injection system, consists of an engine-driven pump which delivers air to the stream of exhaust gases as they are emitted from the combustion chamber and a flow control valve which opens at high engine speeds to divert excess air form the exhaust air injection system to prevent excessive exhaust system back pressure and resulting power loss. (Author abstract modified)

17404 APTIC NO. 35990

Wouwer, Raymond van de

CLINKER COOLER DUST COLLECTOR RECOVERS 60 TPD AT INLAND S WINNIPEG PLANT. *Pit Quarry, 64(7):104-105, Jan. 1972.*

A Wheelabrator Ultra-Jet pulse-type dust collector which operates on a 1000-tpd clinker cooler excess air stream was installed at the Winnipeg plant of Inland Cement Industries. The dust collector units were shipped preassembled to the job site allowing complete field erection in 10 days. In additon to reducing erection time and cost, the method guarantees installation of dust-tight units. Considering the high capital cost of the dust collector bags, much attention was given to control cooler excess air temperature to the dust collector. The problem was successfully solved by the addition of two sonic water nozzles in the inlet duct. Design of the equipment to prevent dust build-up is described.

17405 APTIC NO. 35301

W[illegible]nt, Stuart C. and Robert R. Fredinburg

TIMED MOTORIZED FLUE CLEANING APPARATUS. *(Assignee not given.) U. S. Pat. 3,589,609. 6p., June 29, 1971. 5 refs. (Appl. Dec. 10, 1968, 9 claims).*

Apparatus is described to clean flue gases in restaurants and other commercial establishments where grease is a problem and may be a fire hazard. In order to initiate operation of the flue cleaning apparatus, the associated exhaust system is closed, which of course requires that the exhaust fan or fans be shut off. A very important portion of the flue cleaning apparatus is the flue closing and liquid collecting butterfly valve which is installed near the bottom of the section of flue line with which the cleaning apparatus is operatively associated. The butterfly valve is urged by gravity toward the closed position and and is automatically swingable to the open position upon the actuation of the associated exhaust fan or fans. The butterfly valve is automatically swung from the closed position to the open position in response to air being forced through the associated flue.

17406 APTIC NO. 35290

Yagi, Shizuo, Akira Ishizuya, and Jungi Otani

AFTERBURNER APPARATUS FOR ENGINE EXHAUST GAS. *(Honda Giken Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,590,578. 4p., July 6 1971. 3 refs. (Appl. Sept. 15, 1969, 8 claims).*

With an afterburner chamber of large volume, at the time of engine start-up or low-output power, it is difficult to maintain a high temperature in the interior of the chamber and ensure removal of the unburned ingredients of the internal combustion engine. In the present invention, the exhaust pipes from the cylinders of an internal combustion engine lead to the afterburner chamber and then to a muffler. Either a separate pipe or one of the exhaust pipes constitutes a bypass conduit leading from the afterburner chamber to the muffler. A control valve regulates the flow through the exhaust pipes, with the exception of the bypass conduit, so that the exhaust gases from the cylinders can flow directly to the muffler or can be diverted through the afterburner chamber and bypass conduit to the muffler. The valve device is closed when the engine is at low-power output and open when the engine is at high power putput. (Author abstract modified)

17407 APTIC NO. 35915

Yagi, Shizuo, Akira Ishizutani, and Atsushi Otani

ENGINE EXHAUST GAS RECOMBUSTION APPARATUS. *(Enjin no haiki gasu saiensboshitsu sochi). Text in Japanese. (Honda Technological Research Lab., Wako (Japan)) Japan. Pat. Sho 46-36208. 2p., Oct. 23, 1971. (Appl. Dec. 26, 1968, 1 claim).*

Each cylinder of the engine is directly connected with the muffler by its own exhaust pipe. All the exhaust pipes except for one have adjustment valves which direct the exhaust gas to the recombustion chamber. The pipe which has no valve is also connected with the recombustion chamber, and functions as an exhaust pipe from the recombustion chamber. When exhaust resistance occurs in the recombustion chamber, the valves are opened and the resistance is reduced.

17408 APTIC NO. 35166

Yanagihara, Shigeru

AIR POLLUTION AND AUTOMOTIVE ENGINES (1). *(Taiki osen to jidoshayo kikan (1). Kikai No Kenkyu (Science of Machine), 22(8):1101-1106, 1970. 4 refs. Translated from Japanese. Leo Kanner Assoc., Redwood City, Calif., 26p., Aug. 1971.*

The effects of automotive exhaust emissions on air pollution are reviewed with respect to maximum allowable concentrations, environmental emission standards, regulation of engine exhausts, and various control methods. Automobiles emit carbon dioxide, carbon monoxide, hydrocarbons, soot and lead particulates, aldehydes, and odors as combustion gas from exhaust pipes, crankcase blowby gas, and fuel tank or carburetor vapors. Control methods included engine design modifications, improvements of the air inlet and ignition systems, air-fuel ratio, exhaust, air injection and fuel injection systems, and prevention of evaporation loss.

17409 APTIC NO. 35540

Yocom, J. E. and W. A. Cote

INDOOR/OUTDOOR AIR POLLUTANT RELATIONSHIPS FOR AIR-CONDITIONED BUILDINGS. *ASHRAE (Am. Soc. Heat. Refrig. Air-Cond. Eng.) Proc., vol 77::61-71, 1971. 13 refs.*

The quality of indoor atmospheres is a complex function of a number of variables which include outdoor levels of pollutants, indoor generation of pollutants, permeability of the building, meteorology, and type of ventilation or air conditioning system and its method of operation. A 20-month study of indoor/outdoor air pollutant relationships was conducted at a number of buildings in and around Hartford, Conn., and an analysis is presented of the results obtained in two air conditioned office buildings. Total and respirable suspended particulate matter, soiling particulate matter, carbon monoxide, and sulfur dioxide were measured. Suspended particulate matter inside the buildings was only about one-half that measured outside when makeup air rates were low, indicating that roughing filters used in air conditioning systems are effective in the removal of relatively large particles. Air conditioning systems were not especially effective in the removal of that portion of particulate matter which contains the benzene soluble organic material, the inorganic lead, or which accounts for the soiling properties. As might be expected, carbon monoxide was not affected by air conditioning components.

17410 *APTIC NO. 35730*

Yoshimura, Yoshito

DESULFURIZATION OF FLUE GAS IN PETROCHEMICAL INDUSTRY AND IT S OPERATING DATA. (Sekiyu kagaku kogyo ni okeru haien datsuryu to sono unten jisshirei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(12):1115-1119, Dec. 1971. 3 refs.

In this desulfurization system, sodium sulfite (Na2SO3) concentrate is used as absorbent and sulfur dioxide is absorbed at approximately 60 C. The exhaust gas is cleansed by a prescrubber installed under the absorption tower, and the fly ash and most of the sulfur trioxide in the gas are eliminated in the liquid waste. More than 90% of SO2 is absorbed by Na2SO3, which is then sent to the evaporation-crystallization tank and heated to 100 C. There the SO2 is recovered and Na2SO3 is separated in crystal form. After filtering and separating, the crystals are dissolved in water and is circulated as an absorbent. The cooled and separated SO2 gas is then mixed with the air, compressed and heated, turned into sulfur trioxide in the converter, and absorbed by sulfuric acid in a contact apparatus, where a pure concentrate of sulfuric acid is produced. The residual SO2 in the exhaust gas from this apparatus is returned to the absorption processing. In order to prevent the white smoke and the low dispersion rate of the stack gas caused by the low temperature, the exhaust gas is sent to a reheating system before emission. The temperature is increased to 130 C from about 90 C. In order to maintain the desulfurization rate, SO2 meters were installed at both ends of the flue of the absorption tower. The tower is designed so that the absorption operation will be continued without causing a drop in the rate even when damage in the absorbent supply pipe will discontinue the supply of fresh absorbent. In case of an emergency stop of the desulfurization system, a backup device will switch the operation to a low sulfur content oil. The data over the four months since the start of the operation of the system show that 60,000 100,000 N cu m/H of gas has been treated, and the SO2 concentration at the entrance is generally 1500 2000 ppm, and at the exit is 100 170 ppm.

17411 APTIC NO. 35546

Yusa, Shuitsu

ON THE RELATION BETWEEN THE FLOATABILITY AND THE ELECTRIFICATION OF DUST PARTICLES. *(Funtai no fuyu-sei to taiden-sei ni tsuite). Text in Japanese. Miyagi Kosen Kiyo (J. Miyagi Coll.), no. 2:1-6, 1965. 7 refs.*

The effect of electrification of dust particles on floatability was investigated using powdered matter and two-component mixtures of airborne dusts. The floatability was suppressed by mixing dusts with opposite polarities. Coal dusts with positive charges which were electrified were controlled by mixing with negatively charged rock dust; the charges were simultaneously neutralized.

17412 APTIC NO. 35413

Yushkevich, N. F., V. A. Karzhavin, and A. V. Avdeyeva

PRODUCTION OF SULFUR FROM SULFUR DIOXIDE. *(Polucheniye sery iz sernistogo gaza). Text in Russian. Khim. Prom. (Moscow), 9(3):17-26, 1932. 16 refs.*

In the reduction of sulfur dioxide by generator gas containing hydrogen, that resultant gas contains hydrogen sulfide even if SO2 is present in high concentrations. Theoretical and experimental studies are reported which show the inevitability of the presence of H2S in a gas leaving the catalyst at a high temperature and a method for removing the H2S is described. To decrease the H2S concentration in the resulting gas to 0.1-0.3%, the gaseous mixture, which reacted at 600-800 deg on a bauxite catalyst, must be passed once more through a bauxite-iron catalyst at 220-250 deg. Before this step, the gaseous mixture must be cooled to 130 deg and passed through an electrofilter to remove sulfur which would otherwise condense on the catalyst. After heating the gaseous mixture to 220-250 deg, the reaction of H2S with SO2 occurs, with almost complete removal of H2S.

17413 APTIC NO. 35328

Zhulin, H. V. and A. A. Komlev

UTILIZATION OF FLOCCULATING MEANS FOR PARTICLE SEDIMENTATION FROM GAS CLEANING SOLUTIONS. *(Primeneniye flokulyantov dlya osazhdeniya chastits v rastorakh gazoochistki). Text in Russian. Tsvetn. Metal., 44(8):36-37, Aug. 1971. 3 refs.*

The noxious gases emitted by aluminum producing plants carry dust particles including aluminum fluoride, aluminum oxides, and coke particles. For cleaning purposes, the gaseous mixture is first passed through burners where almost complete burning of carbon monoxide and of coal particles occurs. Removal of 81-91% of the dust particles is then acheived in electrostatic precipitators and 10-18% of the smallest size dust particles are trapped in scrubbers along with hydrogen fluoride, sulfur dioxide, and carbon dioxide by means of a wet procedure utilizing alkaline bicarbonated solutions. The washing liquids contain on the average 24-30 parts sodium fluoride, 10-25 parts sodium carbonate, 40-55 parts sodium bicarbonate, 45-50 parts sodium sulfate, and 10-30 parts solid suspensions at the end of the operation. The density of these solutions ranges from 1.11 to 1.15 g/cu cm at 20 C and their pH ranges from 8 to 9. Clearing of these solutions is best achieved by treatment with hydrolyzed polyacrylamide additions (30 mg/l) whereby sedimentation rates of 19 M/hr can be reached.

MEASUREMENT METHODS

17414 APTIC NO. 35068

ENVIRONMENTAL POLLUTION ANALYSIS WITH THE MILLIPORE MEMBRANE FILTER. *Environ. Letters, 1(2):89-93, 1971.*

The advantages of using the millipore membrane filter for environmental pollution analysis are discussed. The filter can be easily used for isolation of microscopic contaminants and microorganisms, pollution testing, cultures of microbes, chemical spot tests, and particulate analysis. Filter design is examined.

17415 APTIC NO. 35090

Coordinating Research Council, Inc., New York, Program-Analysis Panel

CRC AVIATION EMISSION-MEASUREMENT TECHNIQUE EVALUATION 1969. *CRC Proj. CA-41-65, Rept. 430, 55p., March 1970. 1 ref.*

Methods for sampling, handling, and measuring emissions from aircraft gas turbine engines were evaluated for particulates, hydrocarbons, carbon monoxide, carbon dioxide, nitrogen oxides, and oxygenated compounds. Measurement methods included samplers, cascade impactors, flame ionization detectors, non-dispersive infrared absorption analyzers, the phenol disulphonic acid method, and the MBTH method. Data on experimental procedures, sample handling and probe locations, smoke measurements, and test results are included.

17416 APTIC NO. 35107

Ministry of Commerce and Industry (Japan), Dept. of Environmental Pollution

MONITORING APPARATUS - DESCRIPTION OF EQUIPMENT AND THE LIST OF MANUFACTURERS. *(Sokutei kiki - shori kiki, shiryo teishutsu meka ichiran). Text in Japanese. In: A Survey of Industrial Pollutant Disposal Machines - 1971. p. 188-215, Dec. 1970.*

The characteristics and descriptions are given, with photographic illustrations, of various monitoring apparatus for soot, nitrogen oxides, hydrogen fluoride, oxidants, sulfur dioxide in stack gas or flue, and hydrocarbons. These include automatic continuous counters, traceable anemoscopes, gas chromatography apparatus, and combustion testers.

17417 APTIC NO. 35184

British Standards Inst., London (England)

METHODS FOR THE MEASUREMENT OF AIR POLLUTION. PART 2. DETERMINATION OF CONCENTRATION OF SUSPENDED MATTER. *no. 1747, pt. 2, 16p., 1969.*

Two methods for the estimation of suspended matter in the atmosphere are described. The first enables the concentration of smoke in a sample of air to be obtained in terms of a standard smoke from observations of the darknes of the stain produced when the air is filtered through white paper. A more complicated method, which gives a direct measure of the weight of the material filtered out from the sample of air, must be used when the relative results from the first method are insufficient: for example, if it is required to know how the properties of any actual smoke differ from those of the standard smoke, or if the character, rather than the amount, of any smoke is changing. The apparatus needed for the estimation of smoke in terms of equivalent standard smoke includes a suction pump, gas meter, smoke filter unit, funnel, filter paper, and a reflectometer. Apparatus for the determination of smoke concentrations by direct weighing includes a high volume suction pump, gas meter, two smoke filter units, a funnel, filtration medium, dessicator, and a chemical balance.

17418 APTIC NO. 35240

California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab.

THE MEASUREMENT OF ODOR CONCENTRATION BY DYNAMIC OLFACTOMETRY. *Preprint, California Air Resources Board, Sacramento and California State Dept. of Public Health, 10p., 1971. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

A measurement method for the determination of odor concentration in the atmosphere or in source emissions in terms of a specific odorant is presented, in which the odor is measured at the odor threshold while the odorant is introduced to a stream of deodorized air. The dynamic olfactometer used includes a carbon vane pump, two flowmeters, two deodorizing columns, a 300-ml surge chamber, primary dilution chamber, cyclone mixing chamber, inhalation mask, and sampling probe. The range for ambient atmospheric sampling is 2-1200 dilutions and for captured gas sampling, 2-300,000 dilutions. The reliability of the measurements were determined at plus or minus 30%. Factors interfering with the olfactory perception of the observer include respiratory infections, allergic reactions, irritating noises, and elevated temperatures. Reagents, apparatus, and procedure are detailed.

17419 APTIC NO. 35343

MINATURE CARBON DIOXIDE SENSOR. *National Aeronautics and Space Administration, NASA Tech Brief 71-10536, Dec. 1971, 2p.*

A miniature sensor with no moving parts measures carbon dioxide partial pressures of 0-40 mm Hg for total pressures up to 14 psia with a full-scale accuracy of five percent. The sensor compares the radiation received in two spectral regions: the 4.3 micron region, where CO2 absorption is strong, and the 4.0 micron region, which corresponds to an atmospheric window with no substantial infrared absorption. An infrared detector is positioned to detect radiation from the two spectral regions alternately. When a signal occurs it corresponds to CO2 absorption and accordingly CO2 concentration.

17420 APTIC NO. 35400

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

USERS MANUAL: SAROAD STORAGE AND RETRIEVAL OF AEROMETRIC DATA). ***Pub-APTD-0663, 65p., July 1971.***

NTIS: PB 201408

SAROAD (Storage and Retrieval of Aerometric Data) is the data- handling system adopted by the Environmental Protection Agency and recommended for use nationwide. SAROAD consists of a set of standard formats for recording measurements for different pollutants and associated meteorological observations with various averaging times and a set of standard codes for identifying such items as pollutants, site locations, and methods of sampling and analysis. This manual defines the applicability of the format to various levels of state and local data-handling capability, and explains in detail the mechanisms of recording data in SAROAD format and submitting them to the National Aerometric Data Bank. Some agencies will submit data on SAROAD paper forms, some on punched cards in SAROAD format, and some on magnetic tape in SAROAD. Sections of the manual are addressed to each of these methods.

17421 APTIC NO. 35611

Bureau of Mines, Pittsburgh, Pa.

SAMPLING AND EVALUATING RESPIRABLE COAL MINE DUST. A TRAINING MANUAL. *Bureau of Mines Information Circ. 8503, 47p., Feb. 1971.*

NTIS: PB 197910

The Federal Coal Mine Health and Safety Act of 1969 requires that each operator of a coal mine shall take accurate samples of the amount of respirable dust in the mine atmosphere to which each miner is exposed, a measure designed to prevent the development of coal workers pneumoconiosis. This textbook manual is used in the training of personnel to operate respirable dust sampling devices and to conduct sampling programs. It contains the portions of the act applicable to respirable dust standards, the procedures to be followed to insure compliance with Federal regulations, and descriptions of sampling devices. (Author abstract)

17422 APTIC NO. 35631

Inst. National de Securite pour la Prevention des Accidents du Travail et des Maladies Professionelles, Paris (France)

COMPARISON OF APPARATUS, SAMPLING METHODS AND EXAMINATION IN OPERATIONS FOR CONTROL OF THE RISK OF SILICOSIS. *(Comparaison des appareils, des methodes de prelevements et d examen dans les operations de controle du risque silicotique). Text in French. Colloq. Poussieres Ind., Lille, France, 1953, 48p. (Sept. 26.)*

In sampling operations connected with a program to control silicosis hazards, particles smaller than 0.2 micron and larger than 5 microns need not be retained. To obtain more systematic statistics, testing and reports should concentrate on five particle sizes only, namely 5, 3, 1, 0.5, and 0.2 microns. Sampling equipment used in France and abroad are compared. Two main types of apparatus are in use: the thermal precipitator where observations are made in dry conditions, and the impinger or soluble filter type where observations are made in a liquid medium. For the quantitative chemical analysis of quartz, the phosphoric acid method is the most widely used. Confirmation of results by a physical method, thermal analysis, and particularly by X-ray tests would be desirable.

17423 APTIC NO. 35750

LASER BEAM IDENTIFIES POLLUTION. *Elec. News Eng., 80(9):32-33, Sept. 1971.*

Rapid, precise, on-the-spot identification of pollutant gases in the air may become possible using a laser-light technique. The equipment used for tests includes a tunable laser, called a spin-flip Raman laser, a powerful electromagnet used to tune the laser beam to a desired frequency, a fixed frequency pump laser, and a rotating shutter to interrupt the beam at regular intervals and cause a pulsing action. The laser beam is directed into an optoacoustic absorption cell containing the air sample. The cell contains a sensitive microphone, with a cylindrical diaphragm, which converts changes in air pressure into electrical energy. Each type of gas can be identified by the specific frequency of light that it absorbs. Reference is made to nitric oxide concentration readings.

17424 APTIC NO. 35833

Techmark Industriesteuerungen G.m.b.H., Munich (West Germany)

TRACE ANALYZER FOR SO2 AND NO2 IN AIR. *(Spurenanalysator fuer SO2 und NO2 in Luft). Text in German. Chemiker Ztg. (Heidelberg), 95(22):T134, June 1971.*

A trace analyzer for the measurement of sulfur dioxide and nitrogen dioxide in air has been developed which comprises a rotating disk-shaped gas scrubber, independent flow systems for liquid and fluid, a double beam colorimeter with vertical cells, and a motor driven optical interrupter. The unit can be changed within 10 minutes from an SO2 analyzer to an NO2 analyzer or vice versa. Only a certain unit and the reacting liquid must be exchanged. The measurement range extends from 0.5 ppm to 8.0 ppm. The zero point deviation is less than one percent over 24 hours. The unit is 375 mm high and weighs 32 kg.

17425 APTIC NO. 35895

PROJECT THRESHOLD: TESTING THE TESTS. *Environ. Sci. Technol., 6(1):23-24, Jan. 1972.*

Project Threshold, a venture of the American Society for Testing Materials, was launched to evaluate methods for measuring various atmospheric pollutants. Phase I is designed to evaluate seven test methods for measuring sulfur dioxide, nitrogen dioxide, lead, sulfation rate, and dustfall. Phases II and III will focus on methods for some hydrocarbons, nitric oxide, hydrogen sulfide, mercaptans, and certain particulate matter. To determine the accuracy and precision of its testing methods, the Society has relied on round robin testing: after the committee has decided on the best procedure for a given test, several cooperating independent laboratories make separate analyses of a split sample, following to the letter the written procedure provided by the committee. By comparing results among laboratories, statistically valid accuracy and precision parameters which give some frame of reference for subsequent test results can be determined.

17426 APTIC NO. 35728

Adams, D. F., D. Falgout, J. O. Frohliger, J. B. Pate, A. L. Plumley, R. P. Scaringelli, and P. Urone

TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS). *Health Lab. Sci., 8(4):243-247, Oct. 1971. 7 refs.*

A lead plate which is simpler and less expensive than the lead candle was devised for determination of total atmospheric sulfation. The exposure procedure differs from the lead candle procedure in that an inverted petri dish is used to support the lead dioxide surface rather than a cylinder. The lead sulfate formed is insoluble in water but it can be dissolved in sodium carbonate solution. The lead dioxide is separated from the lead sulfate solution by prior filtration to analysis of sulfate. Sulfate is determined in a spectrophotometric curvette with the absorbance read at 450 nm. Range and sensitivity, interferences, precision and accuracy, apparatus, reagents, procedure, calibration and standards, and effects of storage are indicated.

17427 APTIC NO. 35677

Aitken, John

ON IMPROVEMENTS IN THE APPARATUS FOR COUNTING THE DUST PARTICLES IN THE ATMOSPHERE. *In: Collected Scientific Papers of John Aitken, LL.D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press, 1923, Chapt. 17, p. 207-235. 1 ref.*

An improved model of a particle counter is described in which the air is drawn through a pipe by a gasometer and its connecting pipes. It passes through the measuring apparatus where a mixed quantity of it is taken and passed into the receiver, where it is mixed with a certain quantity of dustless air and saturated with water. The air in the receiver is then expanded by the pump, a shower of rain produced, and the number of drops which fall on a measured area counted. Modifications of the test-receiver, measuring apparatus, air-pump, gasometer, and illuminating stage are discussed in detail. Results obtained with the new apparatus are presented. A portable variety of the apparatus is also described.

17428 APTIC NO. 35679

Aitken, John

ON A SIMPLE POCKET DUST-COUNTER. *In: Collected Scientific Papers of John Aitken, LL.D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press, 1923, Chapt. 18, p. 236-246.*

A pocket instrument is described which gives a rough indication of the impurity of polluted air. A stopcock is first turned a quarter turn to the left, and a piston drawn down. This takes the impure air into the cylinder. The whole of this air is then discharged by pushing the piston to the top of its stroke. By these movements nearly but not quite all the impure air is expelled from the cylinder. The small passage between the stopcock and the piston is still full of impure air. Immediately on pushing the piston to the top of its stroke, the stopcock is returned to its original position; the piston is then drawn down and at once returned to its top position. Thus, some of the pure air has been taken out of the receiver and mixed with the small amount of impure air in the pump passage, and the return stroke has sent the mixture into the receiver, where after being stirred, a shower is produced, and the drops counted. The various parts of the dust-counting apparatus are described.

17429 APTIC NO. 35680

Aitken, John

ON THE NUMBER OF DUST PARTICLES IN THE ATMOSPHERE. *In: Collected Scientific Papers of John Aitken, LL.D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press, 1923, Chapt. 16, p. 187-206.*

In experimenting on condensation in dust-laden supersaturated air, it was noticed that when the particles are few, the drops are large enough, compared to their size when the condensation takes place in ordinary air, that they are easily seen showering down like fine rain. Thus, it appeared possible to count the number of drops that fell on a given area by fixing a small stage or platform inside a receiver at a known distance from the top, having the surface of the stage ruled into squares of a known size, and then counting the number of drops that fell on one of the little squares in order to estimate the number of dust particles in the air tested. The apparatus first used in this investigation is described in detail, as well as necessary precautions and some results obtained by this method of counting.

17430 APTIC NO. 35636

Andersen, A. A.

A SAMPLER FOR RESPIRATORY HEALTH HAZARD ASSESSMENT. *Am. Ind. Hyg. Assoc. J., 27(2):160-165, March-April 1966. 13 refs.*

A multistage-multijet air sampler is described which automatically classifies airborne particles according to their aerodynamic dimension, the only true measure of lung penetrability. The standard instrument, with six 400-jet stages, is calibrated with unit density spheres with respect to particle sizes collected on each stage. Since the selective action of the respiratory system in dealing with dust particles of different aerodynamic sizes is well known, assessments of the health hazard of any sample can be made with the instrument. The small jets make possible the collection of particles at lower jet velocities, on uncoated plates, with sharper particle size discrimination. (Author abstract modified)

17431 APTIC NO. 35826

Anderson, D. H., J. H. Evans, J. J. Murphy, and W. W. White

DETERMINATION OF MERCURY BY A COMBUSTION TECHNIQUE USING GOLD AS A COLLECTOR. *Anal. Chem., 43(11):1511-1512, Sept. 1971. 2 refs.*

A method is described involving combustion of materials containing mercury and the collection of nanogram quantities of mercury on a thin film of gold. The gold is heated at 500 C and the volatilized mercury is determined using resonance absorption of the 253.7-nm wavelength line with background correction. The detection limit is 0.001 microgram of mercury. The total time of an analysis for mercury in hair or fish tissue is less than 15 minutes. Lengthy acid digestion periods are unnecessary, and the many days of elapsed time involved in neutron activation are likewise not needed. Airborne elemental mercury can also be monitored using this collection technique. Preparation of the gold-coated fritted glass disks, the general procedure, calibration of the instruments, and results of the detection of elemental mercury in air samples are discussed.

17432 APTIC NO. 35847

Arato, Eva Sugar

SIMULTANEOUS DETERMINATION OF ARSENIC AND PHOSPHORUS FROM THE AIR. *(Arzen es foszfor egymas mellet torteno meghatarozasa levegoben). Text in Hungarian. Egeszsegtudomany, 15(2):200 204, 1971. 2 refs.*

A procedure is described for the simultaneous determination of arsenic and phosphorus in air. The arsenic and phosphorus are absorbed in an oxidizing mixture, and from an aliquot of the sample solution the combined concentration of arsenic and phosphoric acids is determined by means of the molybdenum reaction. In another aliquot of the sample the arsenic is reduced to hydrogen arsenide, absorbed in an appropriate solution, and the content of the arsenic is determined again by means of the molybdenum reaction. The difference between the results of both determinations yields the phosphorus content of the sample. (Author summary modified)

17433 APTIC NO. 35642

Austin, Robert R., L. Earl Percy, and Edward E. Escher

THE TRITILOG AND ITS APPLICATION TO CONTINUOUS MEASUREMENT OF SULFUR CONCENTRATION IN STREAMS. PART II: FIELD APPLICATIONS. *Gas, 26(6):33-36, June 1950.*

The Tritilog is a high-sensitivity continuous, automatic instrument that measures and records the concentration of organic sulfur compounds in gas streams, embodying electronic control of continuous titration. The earliest field application was to the problem of measuring the concentration of hydrogen sulfide and of naturally occurring mercaptans in Texas natural gas. Study in this field was extended to operation on gas streams in the gas processing plants where gas is treated for sulfur removal before transmission through the high pressure lines to California. The operation of two or more Tritilogs on the same gas supply offers a good means of determining the accuracy of calibration of field instruments as well as a check on the overall reliability of performance. The Tritilog has also been successfully applied to the problems of operating adsorption beds in the process of sulfur removal by activated coal or by catalyst beds. It is also possible, by manual operation of valves to the Tritilog inlet system, to sample the regeneration or purging gas from the bed and thus determine when regeneration is complete. Accurate evaluation of most commercial odorants can now be made with the aid of the Tritilog. It is also possible for the first time to relate odor intensity of an odorized gas to numerical reading of the instrument operating on odorized gas at any point in the system. Another application is in sulfur distribution studies of natural gasoline plant streams. Practical features of Tritilog operation under field conditions are shown by data from typical applications, and the meaning of data bearing on operational characteristics such as reliability, maintenance requirements, and accuracy are discussed.

17434 APTIC NO. 35621

Bando, Shoji, Hiroshi Tominaga, Yutaka Kawakami, and Muneaki Senoo

CHOICE OF ACTIVABLE TRACER FOR SPRAYING ARGICULTURAL INSECTICIDES BY HELICOPTER. *Radioisotop. (Tokyo), 18(11):488-493, Nov. 1969. 3 refs. Translated from Japanese. Japan Information Center of Science and Technology, 13p., Nov. 1970.*

NTIS: NSJ-TR-155

Radioactive tracers to examine the distribution of agricultural insecticide sprayed by helicopters were investigated according to set specifications of type (organic substances), strength of radioactivity, and half-life of activity. Gold and europium were selected as typical tracers; minimum detectable limits were estimated from the activity produced and the background due to inherent interference components. The europium tracer is highest in sensitivity and most favorable in cost if filter paper is used in sampling and a thin scintillator is employed for measuring low-energy photons. (Author abstract modified)

17435 APTIC NO. 35156

Barron, C. I. and J. J. Dreher

EFFECTS OF ELECTRIC FIELDS AND NEGATIVE ION CONCENTRATIONS ON TEST PILOTS. *Preprint, Aerospace Medical Assoc., Washington, D. C., p. 4-7, 1963. (Presented at the Aerospace Medical Assoc., Los Angeles, Calif., April 29-May 2, 1963.)*

Possible biochemical, physiological, and psychomotor effects on test pilots of the combination of moderate negative ion concentration and a positive electrostatic field were studied. Five chemical tests were performed: blood glucose before exposure and immediately after testing; serum non-esterified fatty acids determined in a similar manner; and urinary ketogenic steroids, catecholamines, and serotonin. The last three determinations were performed on urine specimens obtained 1/2, 2, and 6 hours after testing. Brightness discrimination was tested by using a light discrimination apparatus in which a test light could be made brighter or dimmer relative to a constant standard light. Reaction time was determined by using a visual choice reaction time apparatus consisting of a console with a panel of four lights under which is a row of four buttons. Card sorting and arithmetic measurements were performed by requiring the subject to add one-digit numbers on each side of a card and to toss the card into one of 15 compartments numbered 9 through 23 randomly arranged. The final test measured muscular steadiness by requiring the subject to hold a 1/16-inch stylus attached to a gun at arm's length in a 3/16-inch hole in a metal plate and to avoid contact with the sides. Results of this study neither support nor negate the hypothesis that negative ions or electric fields may be beneficial in ameliorating the effects of fatigue or stresss.

17436 *APTIC NO. 35865*

Barth, C. L. and L. B. Polkowski

IDENTIFYING ODOROUS COMPONENTS OF STORED DAIRY MANURE. Preprint, American Society of Agricultural Engineers, Saint Joseph, Mich., 27p., 1971. 27 refs. (Presented at the American Society of Agricultural Engineers, Winter Meeting, Chicago. Ill., Dec. 7-10, 1971, Paper 71-568.)

Techniques for the determination of volatile and liquid odorous components produced in stored liquid dairy manure were examined. Selective absorption, steam distillation, and paper chromatography procedures were effective in the separation, analysis, and identification of gaseous volatile organic acids, amines, ammonia, hydrogen sulfide, mercaptans, and disulfides. (Author summary modified)

17437 APTIC NO. 35967

Bernert, Juergen

EXPERIENCES GAINED DURING DETERMINING THE HYDROGEN SULFIDE CONTENT IN WASTE GASES. *(Erfahrungen bei der Bestimmung von Schwefelwasserstoff in Abgasen). Text in German. Nasser Luft Betrieb, 15(7):259-260, 1971. 18 refs.*

Analytical methods for the determination of hydrogen sulfide are reviewed. Air flows carrying H2S can be trapped in silver ion-containing absorbers or in cadmium hydroxide-containing impingers, whereby H2S is converted into silver or cadmium sulfide, respectively. H2S is then determined spectrophotometrically following its recovery from the salt form (by acid treatment) and its reaction with ammonium molybdate (molybdenum blue procedure) or with N, N-dimethyl-p-phenylenediammonium chloride and ferric ion (methylene blue procedure). These methods work for microgram H2S levels occurring in waste gases but sampling methods, involving dilution, may lead to significant errors. Therefore, absorption into 10% alkaline solutions is recommended (where H2S is the only sulfur-containing compound in the waste gas), followed by oxidation to sulfate with bromine water gravimetric determination as barium sulfate. More sensitive is an iodometric method which processes a cadmium sulfide derivative or an electrolytic method which processes a copper sulfide derivative obtained from cadmium sulfide with copper sulfate. If sulfur dioxide as well as H2S is present in the waste gas, two samples should be analyzed separately, one for total SO2 and H2S determination (gravimetry of BaSO4 following oxidation with nitric acid peroxide solution and precipitation with barium chloride) and the other for H2S; SO2 is then determined by the difference. When mercaptan admixtures exist in the waste gas sample, an electrometric method using a glass reference electrode as an indicator can be applied. The sample is absorbed into a small amount of alkaline ammonia solution and is filtrated with silver solution.

17438 APTIC NO. 35122

Bien, C. T. and Morton Corn

ADHERENCE ON INLET CONDITIONS FOR SELECTED AEROSOL SAMPLING INSTRUMENTS TO SUGGESTED CRITERIA. *Am. Ind. Hyg. Assoc. J., 32(7):453-456, July 1971. 12 refs.*

A properly designed air sampling device for aerosols should be able to collect a sample in the same form and particle size distribution as it exists in the air. Aerosol sampling is a complicated physical problem which depends on the inertia and sedimentation properties of particles, the air sampling rate, the geometry and orientation of the sampling head, and the ambient wind speed and direction. The criteria suggested by Davies for efficient collection of representative aerosol samples have been applied to nine commonly used aerosol samplers. Results indicate that the physical dimensions or sampling rates of most of these instruments should be altered to ensure efficient collection of samples on which valid conclusions may be based. These instruments include electrostatic precipitators, a cascade impactor, an impinger, cyclones, and an elutriator. (Author abstract modified)

17439 APTIC NO. 35976

Bien, C. T. and Morton Corn

PERFORMANCE OF RESPIRABLE DUST SAMPLERS WITH FIBROUS DUST. *Am. Ind. Hyg. Assoc. J., 32(8):499-507, Aug. 1971. 24 refs.*

Polydisperse fiberglass particles were dispersed in air by means of a Wright dust feeder in order to calibrate several commonly used two-stage air samplers. The particle size-weight distributions of the airborne fiberglass dust and the dust collected in the samplers were determined by sedimentation analysis in water using a microbalance. The sampling rates selected for the instruments were those previously reported by workers demanding instrument performance for spherical, unit density particles in accordance with the British Medical Research Council or U.S. Atomic Energy Commission lung deposition models. Fibers classified according to their aerodynamic equivalent diameters in devices which establish streamline flow of air behaved differently than spherical particles of corresponding size in cyclone collectors. A higher instrument sampling rate was required to achieve fiberglass dust collection in accordance with calibration standards for spheres. According to criteria proposed by Davies, the diameters of two-stage dust-sampling instrument heads are too small to obtain a representative sample of the airborne dust. (Author abstract modified)

17440 APTIC NO. 35500

Bignardi, Luigi

SMOKE DENSITY METER. *(Rauchichte-Messgeraet). Text in German. (Snam Progetti S. p. A., Mailand (Italy)) W. Ger. Pat. 1,798,242. 4p., Aug. 26, 1971. 3 refs. (Appl. Sept. 13, 1968, 4 claims).*

A smoke density meter for diesel engine exhaust gas monitoring is examined. The meter is based on the principle of a light beam directed transversely through the gas flow to be detected by a photocell. To prevent soiling of the lenses, the gases flow through a venturi tube, and the light passes across the constriction in this tube.

17441 APTIC NO. 35935

Blacker, J. H. and R. S. Brief

A DILUTION SYSTEM FOR DYNAMIC PREPARATION OF GAS CONCENTRATIONS. *Am. Ind. Hyg. Assoc. J., 32(10):668-672, Oct. 1971. 5 refs.*

A system for the calibration of air pollution monitoring instruments is examined. The construction details of a portable system for dynamic preparation of gas concentrations are described. Permeation or diffusion tubes are used for generating the required gases. House air passes through a heatless dryer to obtain pure dry air prior to entering the system. Two dilution and bleed stations and a temperature controlled oven allow production of a wide range of concentrations. Industrial hygiene exposures may also be simulated. Experiments with nitrogen dioxide, sulfur dioxide, hydrogen sulfide, and hexane are discussed. (Author abstract modified)

17442 APTIC NO. 35426

Blosser, E. R.

IDENTIFICATION AND ESTIMATION OF IONS, MOLECULES, AND COMPOUNDS IN PARTICULATE MATTER COLLECTED FROM AMBIENT AIR. (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Air Pollution Control Office Contract CPA-70-159, 65p., July 23, 1971.0*

NTIS: PB 201738

Methods were developed and applied to ambient air particulate samples to identify and estimate elements and compounds. Preliminary to compound identification, the elemental analyses of some 74 samples collected on filters were obtained using a variety of methods. Oxygen analyses were made using a sample collected on a silver filter; x-ray diffraction studies were performed on samples removed from all-nylon filters, and on density-separated fractions of these samples. Conventional chemical analyses, optical emission spectrography, spark-source mass spectrography, and x-ray fluorescence are considered. Electron microprobe examination was also used for compound identification. Density separation and particle size separation are discussed, in addition to S and S glass filters, contact paper, and the analysis of effluent from a reactive metals furnace. (Author abstract modified)

17443 APTIC NO. 35241

Boubel, Richard W.

EMISSION SAMPLING FROM GRASS BURNING. *Preprint, California Air Resources Board, Sacramento and California State Dept. of Public Health, 9p., 1971. 4 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

Continuous carbon monoxide measurements from tower and field burns were used as the common denominator for correlation studies of sampling instrumentation and analytical techniques for emissions from grass burning. Gases sampled at the burning tower included total and individual hydrocarbons, carbon monoxide, carbon dioxide, and nitrogen oxides. As a check on the validity of the CO2 correlations, the temperature of the effluent gases was determined for both tower and field burns. The sampling apparatus consisted of a particulate sampler with a membrane filter, thermocouples, and potentiometric recorders for continuous temperature recordings. CO2 was sampled with a nondispersive infrared analyzer. Results are being evaluated against laboratory data to obtain an accurate emissions inventory from this source.

17444 APTIC NO. 35876

Boyne, L., J. Dyment, and I. D. Thomason

GENERATION OF A SODIUM CHLORIDE AEROSOL FOR IN-PLACE TESTING OF AIR FILTERS. *Filtration Separation ([illegible]), 8(6):709-712, Nov./Dec. 1971. 8 refs.*

Possible methods of producing a submicron sodium chloride aerosol in sufficient quantity and of suitable particle size distribution for in-place testing of large filter installations with simple, portable, and inexpensive equipment were investigated. The flame evaporation method was chosen for development as it satisfied criteria for particle size distribution, adequately stable output, and ease of operation. This method of generating sodium chloride aerosols could have a wider application because it generates an aerosol of mass median diameter in the range 0.3-0.4 micron, very close to that now considered most desirable for a European Standard for production control tests on filter units. The equipment, together with recommended methods of preparing the feed material, is described. (Author abstract modified)

17445 APTIC NO. 35121

Braman, Robert S.

DIRECT CURRENT DISCHARGE EMISSION SPECTRA FOR DETECTION AND IDENTIFICATION OF SOME AIR POLLUTANT COMPOUNDS. *Atmos. Environ. (London), 5(8):669-675, Aug. 1971. 5 refs. (Presented at the National Air Pollution Control Administration, Symposium on Advances in Instrumentation for Air Pollution Control, Cincinnati, Ohio, May 26-28, 1969.)*

A four-channel dc discharge emission type detector was used in a gas chromatographic study of the emission response of nitrogen oxides, carbon monoxide, carbon dioxide, carbon oxysulfide, sulfur dioxide, and selected organic compounds. Limits of detection for the inorganic gases were in the 10 to the minus 9th power to 10 to the minus 11th power liter range. Identification of compounds by a normalized relative response ratio technique was feasible. The structure and chain length of a homologous series of compounds influences the comparative response obtained at the emission wave lengths of the C2,CH, CN bands and H line selected for study. The elemental composition of the inorganic gases was reflected in the relative responses obtained. (Author abstract)

17446 APTIC NO. 35242

Brief, Richard S.

THE EMISSION INVENTORY. *Preprint, California Air Resources Board, Sacramento and California State Dept. of Public Health, 15p., 1971. 7 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

Source testing to substantiate values for working material balances in chemical plants and refineries is reviewed. The reasons for sampling and the source characteristics will determine the essential components needed in the sampling train; e.g., it may be of interest to know the chemical and physical characteristics of exhaust aerosols or particle size distribution, shape, density, and composition. The source may vary in either velocity or mass flow rate, or both, throughout the cross section of the stack and in time. Isokinetic sampling techniques will be followed when sampling for particulates. Measurement methods are reviewed for steady source conditions with nonuniform flow, unsteady but uniform conditions, and nonuniform source and flow. Volumetric rate determination is reviewed. The sequence of components in a sampling train are described.

17447 APTIC NO. 35179

Busch, George E., John F. Cornelius, Richard T. Mahoney, Robert I. Morse, Donald W. Schlosser, and Kent R. Wilson

PHOTOFRAGMENT SPECTROMETER. *Rev. Sci. Instr., 41(7):1066-1073, July 1970. 041 refs.*

An apparatus for photofragment spectroscopy, a new type of molecular spectroscopy for dissociative electronic states, is described. Inside an ultrahigh vacuum system, a molecular beam is crossed by pulses of polarized light (from a theta-pinch discharge or from various lasers, including ruby, second harmonic ruby, second harmonic neodymium-glass, and laser pumped tunable dye) and the recoiling photodissociation fragments are detected by a quadrupole mass spectrometer a few centimeters away. The data are collected and analyzed by an on-line time shared computer and presented on a computer driven oscilloscope display as plots of number of fragments detected per microsecond vs time after the laser pulse. Parameters such as photon energy, photon flux, fragment mass, and fragment laboratory recoil angle with respect to the electric vector of the light can be varied to obtain a multidimensional spectrum. This spectrum, the probability of photodissociation as a function of photon energy and flux and of fragment mass, center-of-mass translational energy, and center-of-mass angle of recoil, may be used to study many aspects of molecular states. The method is being applied to study of the detailed nature of the photodissociation steps in air pollution. (Author abstract modified)

17448 APTIC NO. 35899

Cameron, J. F.

RADIOISOTOPE TECHNIQUES FOR MEASUREMENT AND CONTROL OF INDUSTRIAL POLLUTION. *Meas. Contr., 4(11):303-307, Nov. 1971. 17 refs. (Presented at the Institute of Measurement and Control, Symposium on Measurement and Control of Industrial Pollution, Maidstone, England, April 28-29, 1971.)*

Radioisotope techniques used for measurement and control of industrial pollution, including radioisotope instruments and tracers, activation analysis, and radiation treatment of waste water and processing of chemicals, are described. Radioisotope instruments monitor and control potential sources of pollution such as sulfur in hydrocarbons or ash in coal and papers, measure the concentration of pollutants in air and water, and assist in the control of sewage treatment plants. Activation analysis provides a sensitive, specific, and versatile method for elemental analyses of pollutants in air, water, plants, and animals, while radioisotope tracer techniques permit the study of the movement of liquid effluents and atmospheric pollutants, and trace the origins of oil spillages. Radiation treatment of waste water is feasible but uneconomic at present, and radiation processing can produce chemicals useful in combating pollution. (Author abstract modified)

17449 APTIC NO. 35954

Chapron, Yves

PROCESS AND APPARATUS FOR DETECTION OF IM PURITIES AND APPLICATIONS OF THE PROCESS. *(Procede, dispositif de detection d impuretes et application du procede). Text in French. (Commissariat a l Energie Atomique, Paris (France)) Swiss Pat. 505,386. 5p., May 14, 1971. (Appl. March 28, 1969, 9 claims).*

A process and equipment are described for detecting gaseous atmospheric pollutants such as halogens (except fluorine), halides, cyanides, and sulfur compounds, by dissolving these pollutants in water and circulating the solution through an electrolyte which is in contact with two electrodes to which a permanent voltage has been applied. Earlier methods based on a similar principle use the change in amperage caused by the above procedure as a measure for determining the concentration of impurities; the present invention utilizes the readings of changes of voltage, rather than amperage. The system is faster, more sensitive, more accurate, and ensures a longer life of electrodes than earlier methods. The electrolyte, stored in a small tank, flows through a capillary spiral tube where it mixes with the polluted air to be tested. It then enters an electrolytic cell from where it is recirculated to the tank. The cell comprises a lower part of stainless steel, machined inside to obtain a hollow hemispherical concave surface and plated with platinum or gold to form the counter-electrode; and an upper half made of insulating material, with a conical interior and a neck at the top to accommodate the electrode, which is made of silver. Sodium acetate dissolved in acetic acid, with a very small amount of a silver salt added can be used as an electrolyte. The change in potential difference that occurs between the electrode and counter-electrode upon entry and circulation of the pollutants, as indicated on a voltmeter, provides a measure of the concentration of pollutants. For instance, 0.1 to 40 ppm hydrochloric acid will cause a voltage change ranging from 2.5 to 100 mV.

17450 APTIC NO. 35131

Chatot, G., M. Jay, W. Jequier, and R. Fontanges

PURIFICATION OF ATMOSPHERIC POLYCYCLIC AROMATIC HYDROCARBONS BY THIN LAYER CHROMATOGRAPHY. *(Purification des hydrocarbures aromatiques polycycliques de l atmosphere par chromatographie sur couches mines. Text in French. Chim. Anal. (Paris), 52(11):1264- 1269, Nov. 1970. 18 refs.*

A method is described which separates aromatic polycyclic hydrocarbons from aliphatic hydrocarbons contained in atmospheric dust extracted by benzene in a Soxhlet. A twenty gram sample of atmospheric dust from Grenoble contained four percent organic matter. The separation was achieved by thin layer chromatography in four steps, and results of the separation were checked by gas chromatography and by mass spectrometry. In the first step all fluorescent polycyclic hydrocarbons were separated from the organic pool, thus eliminating an important fraction of aliphatic hydrocarbons. The second step separated the fluorescent hydrocarbons into two zones, the first consisting of polycyclic aromatic hydrocarbons, which was verified by other methods. The third step consisted of two dimensional chromatography yielding two zones, one of which was non fluorescent and aliphatic, which was verified by gas chromatography. A fourth step eliminates aliphatic hydrocarbons almost totally. In mass spectrography, aliphatic peaks diminish less markedly following each step, which is probably due to long chainalkylbenzenes whose chromatographic behavior resembles that of polycyclic hydrocarbons. But this residue is small, as shown by planimeteric measurement of surfaces occupied by paraffins on the various chromatograms (fresh extract 360 sq cm, following second step 260 sq cm, following third step 52 sq cm, following fourth step 2.5 sq cm).

17451 APTIC NO. 35553

Cline, Edwin L.

APPARATUS AND METHOD FOR ANALYZING ENGINE EXHAUST GAS. *(Clayton Mfg. Co., El Monte, Calif.) U. S. Pat. 3,581, 555. 14p., June 1, 1971. 6 refs. (Appl. Oct. 4, 1965, 20 claims).*

An apparatus is presented for continuously analyzing engine exhaust gas; it is an improvement over prior exhaust gas, air-to-fuel ratio analyzers which were unable to compensate for the effect of variations in temperature and rates of flow and which required frequent cleaning. The apparatus comprises a positive displacement pump which proportionately mixes water with the engine exhaust gas to wash the exhaust gas, reduce its temperature, and entrain any foreign particles present in the gas. The mixture of water and exhaust gas is then passed through a centrifugal separator, which separates the gas from the water and contaminants entrained therein, and delivers the cooled and clean gas at a substantially uniform rate and pressure to a test cell of an exhaust gas analyzing unit which measures its thermal conductivity. Thermal conductivity is measured by passing the exhaust gas over a heating or glowing electrical resistance element. Since the thermal conductivity of engine exhaust gas bears a definite, known relationship to the air-to-fuel ratio, it is possible to evaluate engine performance. Automobile engine performance is largely determined by the capability of the carburetor to function for supplying air and fuel in the proper proportions to satisfy the varying engine-operating conditions.

17452 APTIC NO. 35309

Confer, Robert G., Adepeju Adelaja, and Richard S. Brief

VARIABILITY OF OXIDANT LEVELS AT MONITORING STATIONS 100 FEET APART. *Am. Ind. Hyg. Assoc. J., 32(9):565-572, Sept. 1971. 13 refs. (Presented at the American Industrial Hygiene Conference, Toronto, Ontario, May 26, 1971.)*

A series of tests were carried out to determine the reasons for a two-fold difference in average ambient levels of oxidant as measured at two monitoring stations situated about 100 feet apart. The major differences at the two sites were the following: different instruments were used to measure oxidant; the main sampling line was glass at one site and stainless steel at the other; sampling inlets were 12 feet above grade at one site and 30 feet at the other; one station was on the periphery of a large parking area while the other site was 100 feet from the parking area. The differences in oxidant level found were expected to relate to one or more of these factors. However, the main factor was indicated to be the difference in the response of the instruments used for the measurements. To evaluate the mast model 725-2 ozone meter relative to the neutral buffered potassium iodide method, a series of tests were carried out in the laboratory. A design for a dynamic calibration system for oxidant measurements is described. (Author abstract modified)

17453 APTIC NO. 35243

Cooper, Hal B. H., Jr. and August T. Rossano, Jr.

CONTINUOUS SOURCE MONITORING OF GASEOUS SULFUR COMPOUNDS IN THE PAPER INDUSTRY. *Preprint, California Air Resources Board, Sacramento, and California State Dept. of Public Health, 42p., 1971. 31 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

Monitoring techniques and regulatory aspects, including emission standards for gaseous sulfur compounds emitted by sulfite and kraft pulp mills are examined. Pulping processes, major sources, and principal pollutants, e.g., sulfur dioxide and sulfur trioxide, methyl mercaptan, dimethyl sulfide, and hydrogen sulfide, are reviewed. Continuous monitoring methods include electrolytic conductivity, ultraviolet spectrometry, coulometric titration, ultraviolet spectrophotometry, and process gas chromatography. Mobile laboratories, sampling procedures, flow measurement, and instrument calibration are discussed. Costs and manpower requirements for the instruments are included.

17454 APTIC NO. 35956

Cooper, Hal B. H., Jr. and August T. Rossano, Jr.

SOURCE TESTING FOR AIR POLLUTION CONTROL. *Wilton, Conn., Environmental Research and Applications, Inc., 1971, 228p. 532 refs.*

Source testing for air pollution control is reviewed with respect to basic procedures, terminology, operating and theoretical priciples, gas flow measurements, sampling trains, principles and methodology of particulate sampling, gaseous sampling, continuous monitoring, and special applications of various techniques. Measurements of stack gas parameters prior to sampling are discussed for determinations of temperature, pressure, moisture content, and gas composition using such instruments as thermometers, thermocouples, thermistors, wet or dry bulbs, condensation methods, Orsat analyzers, pitot tubes, anemometers, tracers, balloons, and various meters. Instrumentation for particulate sampling includes sampling probes, flowmeters, wet impingers, filters, centrifugal separators, and electrostatic and thermal precipitators. Particulate sampling trains are examined with respect to specific contaminants (polynuclear hydrocarbons, fluoride compounds, mists, tars, and droplets); combustion sources, e.g., boilers, incinerators, open burning, pulp and paper plants, lime kilns, kraft recovery furnaces, chemical processing, and metallurgical operations; and particle size analysis using impingers and cascade impactors. Sampling techniques for gases containing sulfur oxides, hydrogen sulfide, mercaptans, total sulfur, nitrogen oxides, ammonia, chlorine compounds, carbon monoxide, and organic gases and vapors include absorption into a liquid phase, using sample probes and impingers; collection in fabric bags; adsorption on a solid; and freeze-out techniques. Subsequent analytical methods include wet chemical analysis (turbidimetry, colorimetry, potentiometry, polarography, iodimetric methods, and Orsat analysis) and instrumental analysis (gas chromatography, spectrophotometry, flame ionization, and mass spectrometry). Special applications for the techniques include determination of odor thresholds of flue gases, measurement of acid deposition onto metal surfaces, the presence of radioactive materials, and bacterial emissions to the atmosphere. Pertinent source test data and sources of equipment are included.

17455 APTIC NO. 35288

Courbon, Paul

DEVICE FOR THE CONTINUOUS DETECTION OF DUST IN THE ATMOSPHERE. *(Charbonnages De France, Paris) U. S. Pat. 3,590,629. 6p., July 6, 1971. 2 refs. (Appl. April 6, 1970, 16 claims).*

An apparatus is described which permits the continuous and prolonged sampling of polluted atmospheres without requiring the subsequent handling of the filter element in order to evaluate the rate of dust loading. A thin filter element is mounted integrally with a centrifugal fanlike rotor so that when the rotor is rotated, air will be drawn through the filter. This assembly is mounted within a fairly spaceous enclosure with limited ingress and egress orifices so that the air will tend to be recirculated within the enclosure. Solid particles in the air entering the enclosure will tend to be collected in a spot at the center of the filter element; the size of the spot is a measure of the amount of dust in the air. (Author abstract modified)

17456 APTIC NO. 35457

Cowley, J. M., D. J. Smith, and G. A. Sussex

APPLICATIONS OF A HIGH-VOLTAGE TRANSMISSION SCANNING ELECTRON MICROSCOPE. *Scanning Electron. Microsc., vol. 3:9-16, 1970. 9 refs. (Presented at the IIT Research Inst., Scanning Electron Microscope Symposium, Annual, 3rd, Chicago, Ill., April, 1970.)*

Wide-angle convergent beam diffraction patterns in graphite crystal were obtained with a transmission scanning electron microscope operating at up to 600 kV. The appearance of K-lines showing the separation of dark-light pairs provides a means of measuring the curvature of crystals over distances of one micron or less and also the lattice distortions associated with dislocations. Various arrangements are discussed for the imaging of electrons in air or in some controlled atmospheres by passing the electron beam through a thin window and detecting the transmitted or reflected electrons by a scintillator, also in air. Preliminary experiments to this end are in progress.

17457 APTIC NO. 35183

Craig, Charles D.

REPORT ON THE FEASIBILITY AND ADVISABILITY OF DEVELOPING A BALLOON-BORNE ELECTRICAL AEROSOL PARTICLE COUNTING AND SIZE DISTRIBUTION MEASURING SYSTEM. *In: A study of the Natural Ventilation of the Columbia-Willametter Valleys.*

It is feasible but not advisable to combine the Gerdien capacitor with a sonic jet ionizer to produce a balloon-borne aerosol particle counter and size analyzer. Such an instrument is unnecessary as a compliment to lidar measurements, since extensive investigations have established that aerosol particles follow the r-4 distribution for particles with radii greater that .05 micron. The Gerdien device is nothing more than a cylindrical capacitor whose current voltage characteristic is proportional to the mobility distribution. A sonic jet ion generator is preferable to other types of ion sources because it is stable and can be designed to deliver the required quantity of ions in a concentrated stream that is easily mixed with the aerosol (diffusion charging). An instrument weighing roughly 10 lbs could be developed in two years at a cost of approximately $20,000.

17458 APTIC NO. 35129

Dmitriev, M. T., T. V. Solovieva, L. P. Serbina, and S. A. Fomina

SEPARATE DETERMINATION OF NITROGEN OXIDES IN THE ATMOSPHERE. *(Razdelnoye opredeleniye okislov azota v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 9:60-64, 1971. 7 refs.*

A method for the determination of nitrogen oxides such as nitric oxide and nitrogen dioxide by oxidation of NO into NO2 and further determination of total NO2 by spectrophotometry of an NO2 generated azo dye is described. The best oxidation conditions for NO occurred with a three percent solution of potassium bichromate in a 2.5% solution of sulfuric acid applied on a diatomite or glass powder surface, achieving 25% oxidation yields. The air sample to be analyzed is passed through a sampling system including two absorber units and a U-shaped oxidation tube containing the oxidant. Intercalation of a pumice containing tube between the two absorber units increased the yield in NO by 1.75 times, due to the removal of moisture from the air sample. When applied to field conditions (urban area) the method showed NO to be higher than NO2 in 78% of the cases, and 20-30-fold compared to NO2 in automobile exhaust gases containing seven to eight g/cu m of nitrogen oxides. The sensitivity of the above method for each of the two nitrogen oxides approaches 0.3 microgram for each of the compounds contained in a certain air sample volume due to the high NO oxidation yields.

17459 APTIC NO. 35302

Dodson, Michael and Raymond J. Gomez

APPARATUS AND METHOD FOR EXHAUST ANALYSIS. *(Beckman Instruments, Inc., Fullerton, Calif.) U. S. Pat. 3,593,023. 9p., July 13, 1971. 7 refs. (Appl. March 27, 1969, 35 claims).*

An apparatus and method are described for analyzing particular constituents in the exhaust gas of internal combustion engines. The exhaust gas is conveyed by a pump to an air cooled condenser to lower the temperature of the gas to essentially ambient temperature and thus condense any water vapor which may be present. The gas is then heated to a temperature above the ambient temperature while being conveyed from the condenser through a conduit to a sample cell of a radiant energy analyzer, such as a nondispersive infrared analyzer. Therefore, no water vapor in the gas passing through the conduit or cell will condense upon the walls and interfere in the analysis of the gas. This arrangement eliminates the commonly utilized ice cooled condenser, thus substantially lowering the cost of the apparatus and avoiding the ice maintenance problem. The cell is positioned above a water trap in the condenser a distance sufficiently great so that no water in the trap will be carried into the cell by the flow of gas passing through the apparatus. The gas is preferably conveyed through the apparatus by means of a jet pump which embodies a restriction at its outer end to provide automatic pressure regulation. For an inexpensive analyzer, it is preferred that the detector be of the type known as a thermistor bolometer. (Author abstract modified)

17460 APTIC NO. 35541

Dravnieks, A. and J. Whitfield

GAS CHROMATOGRAPHIC STUDY OF AIR QUALITY IN SCHOOLS. *ASHRAE (Am. Soc. Heat. Refrig. Air-Cond. Eng.) Proc., vol. 77:113-123, 1971. 13 refs.*

By use of high-capacity organic vapor collection devices and appropriate sample transfer analysis techniques, combined with psychophysical odor evaluation of the gas chromatically resolved components at the effluent port of a gas chromatograph, it is possible to gather considerable insight into the inventory of the odorous components of an air sample. These procedures were applied to a study of air in several Chicago metropolitan area schools. The outside air was also examined, to permit assessments of the contribution of outside air pollution to the air pollution of the school air by organic vapors and odorants. The gas chromatographic parameters were then inspected, using non-parametric statistics for correlations to the air quality which was first independently ranked using engineering data and on-the-spot observations. (Author introduction)

17461 APTIC NO. 35404

Druzhinin, A. A.

KINETIC METHODS OF ANALYZING ORGANIC COMPOUNDS. *Zh. Vses. Khim. Obshchestva im. D. I. Mendeleeva, 15(5):529-536, Oct. 9, 1970. 67 refs. Translated from Russian in: Atmospheric Studies at Chemical Enterprises - USSR, p. 102-118, March 9, 1971. Joint Publications Research Service, Washington, D. C.*

NTIS: JPRS-52566

Kinetic analysis is based on the dependence of the chemical process rate on the concentrations of components participating in accordance with the general laws of kinetics and catalysis. The high sensitivity of the method combined with satisfactory specificity, sufficient accuracy of analysis, and relatively simple technical execution make it suitable for determining the small maximum permissible concentrations (MPC) of certain harmful industrial agents. Inorganic compounds, and especially cations of heavy elements, are kinetically analyzed mainly on the basis of their catalytic properties. These properties are used to a lesser degree in kinetic analysis of organic compounds because of the saturated covalent bonds characteristic of the latter. However, theoretical data indicate that the majority of catalytic reactions of organic compounds can be used for highly sensitive analyses, including their capacity for reversible or semireversible oxidation and reduction. Redox reactions involving direct electron transfer between reagents and catalyst and processes where the catalyst forms intermediate compounds with the reagents are described schematically.

17462 APTIC NO. 35894

Dubois, L. and J. L. Monkman

CONTINUOUS DETERMINATION OF CARBON MONOXIDE BY FRONTAL ANALYSIS. *Anal. Chem., 44(1):74-76, Jan. 1972. 2 refs.*

A new instrument for the measurement of carbon monoxide in air is described which makes use of the principle of frontal analysis. Air is passed over an adsorbent until an equilibrium is established between the concentrations of CO in the air and the concentration of CO on the adsorbent. When the sampling is completed, the sample is eluted with hydrogen and any CO present is converted to methane which is then measured with a flame ionization detector. With a system of 4 columns and an automatic switching device, it is possible to use this instrument on a continuous basis to measure the average concentrations of CO in air every 6 min (Author abstract modified)

17463 APTIC NO. 35514

Engelhardt, Heinz, Helmar Krupp, Harry Wismath, Helmut Rabenhorst, and Gottfried Spengler

GAS ANALYZER. *(Vorrichtung zur Messung des Gehaltes an paramagnetischen Gasen in Gasgemischen). Text in German. (Hartmann and Braun A. G., Frankfurt am Main (West Germany)) W. Ger. Pat. DAS 1,498,778. 4p., Sept. 2, 1971. 3 refs. (Appl. June 5, 1963, 5 claims).*

A gas analyzer is described which utilizes the technique of measuring flux variations produced by periodic changes in gas pressure within a tubular gas flow chamber between the poles of a magnet. The ends of the flow chamber are bounded by emitting surfaces, preferably of ultrasonic generators, which produce standing waves in the chamber so that a pressure antinode occurs between the magnetic poles in the region of maximum flux.

17464 APTIC NO. 35640

Falk, Hans L., Paul Kotin, and Adele Miller

AROMATIC POLYCYCLIC HYDROCARBONS IN POLLUTED AIR AS INDICATORS OF CARCINOGENIC HAZARDS. *Intern. J. Air Pollution, vol. 2:201-209, 1960. 25 refs. (Presented at the American Chemical Society, National Meeting, Symposium on Polycyclic Hydrocarbons, 136th, Atlantic City, N. J., Sept. 17, 1959.)*

Biologic assay is the best method for evaluating the carcinogenic risk involved in breathing polluted air; yet the lengthy procedure and other factors involved preclude its use. Consequently, the concentration of 3,4-benzyprene in air samples is used as an indicator of carcinogenic risks. There are two shortcomings to this approach. First, polluted air frequently contains substances other than the polycyclic aromatic hydrocarbons which will produce cancer. Second, there is no accounting for other effects of polluted air. These effects, although not carcinogenic, may enhance the carcinogenic process by inhibiting the normal physiologic process by which foreign materials are eliminated from the lung. The slowing and cessation of the mucous flow in the lung are the result of inhalation of irritants such as automobile exhaust. Soot is a major source of 3,4-benzpyrene; rubber tire dust is another. The liberation of benzpyrene from rubber tire dust by an aqueous protein solution such as that encountered in the lung, occurs rapidly. Competitive effects have been observed between aromatic polycyclic hydrocarbons as found on soot and dust with regard to the production of tumors. As there is marked structural similarity between cancer-producing and inactive compounds, the intracellular site of action may be common for both groups and the latter may thus inhibit the action of the former in producing cancer. It is apparent that a chemical method for the evaluation of the carinogenic potency of polluted air requires determination of all polycyclic hydrocarbons elutable by protein solutions. (Author abstract modified)

17465 APTIC NO. 35591

Flocchini, R. G., P. J. Feeney, R. J. Sommerville, and T. A. Cahill

SENSITIVITY VERSUS TARGET BACKINGS FOR ELEMENTAL ANALYSIS BY ALPHA EXCITED X-RAY FLUORESCENCE. *Preprint, American Nuclear Society, 19p., 1971. 12 refs. (Presented at the American Nuclear Society, Columbia, Mo., Aug. 23, 1971.)*

The sensitivity of elemental analysis by charged-particle induced x-ray fluoresence is examined by measuring characteristic x-ray cross sections for K-alpha, K-beta, L-alpha, L-beta, L-gamma, and M transitions for many elements and bremsstrahlung backgrounds from thin mylar, kapton, and teflon films between 0.7 and 8mg/sq cm thickness. Sensitivities are given as a function of target atomic number, backing thickness, incident beam charge, energy and flux, and detector configuration. An evaluation of the strengths and weaknesses of charged-particle induced x-ray fluorescent elemental analysis is included. A system utilizing this method is now under construction for the analysis of atmospheric gas and aerosol samples. (Author abstract modified)

17466 APTIC NO. 35488

Friedlander, S. K.

THE CHARACTERIZATION OF AEROSOLS DISTRIBUTED WITH RESPECT TO SIZE AND CHEMICAL COMPOSITION -- II. CLASSIFICATION AND DESIGN OF AEROSOL MEASURING DEVICES. *J. Aerosol Sci., 2(3):331-340, Aug. 1971. 10 refs.*

Many different devices and techniques for studying the properties of aerosols can be classified according to the information they give on the composition probability density function (pdf). In general, these devices (single particle counter, electrical mobility analyzer, condensation nuclei counter, impactor, impactor-chemical analyzer, whole-sample chemical analyzer) provide data on certain integral functions of the composition pdf. It would be useful for research purposes to perfect a single particle counter-analyzer that would permit determination of the pfd. Such a device would probably be expensive and require extensive data-handling facilities. For many purposes, it is suffect to measure integral functions of the pdf, which may give enough information to estimate biological responses or other types of aerosol effects. There is a particular need for a fast response chemical analyzer classifying particles according to size and giving average composition over a size range. A quantitative estimate of the amount of information provided by an aerosol instrument can be made by employing the information function. This function is equal to the minimum number of decisions which must be made by a counter comparing particles with a series of standard sizes. The information function is also a measure of the polydiserpsion of the aerosol and increases when aerosols are mixed. As a results, spurious mixing information is generated when time-averaging devices are used to measure the particle size spectrum.

17467 APTIC NO. 35157

Fuzita, Yoshio, Toshio Shiono, and Koichiro Shinra

DETERMINATION OF CARBON MONOXIDE IN THE ATMOSPHERE. *(Taikichu no issanka tanso no teiryo). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 19(12):1624-1628, Dec. 1970. 5 refs.*

Carbon monoxide in the atmosphere was oxidized to carbon dioxide and absorbed in a standard alkali solution. The conductance of the alkali solution was measured and the amount of CO estimated from the decrease in conductance. The CO2 and organic components initially present in the atmosphere were removed through the concentrated alkali solution and a potassium permanganate solution containing sulfuric acid. In the recommended procedure, 10 ml of .005 to .0005 mol solution are used as the standard alkali and a mixture of hopcalite and lead peroxide (4:1) is used as the oxidizing agent. Carbon monoxide, in the range of 5.5 to 100 ppm, was determined within a 10% error with a flow rate of 0.2 l air/min, an oxidizing temperature of 130 C, and a measuring temperature of 15 C. (Author abstract modified)

17468 APTIC NO. 35182

Gaynullina, E. T.

BIONICS AS APPLIED TO ANALYTICAL RESEARCH. *Zh. Vses. Khim. Obshchestva im. D. I. Mendeleeva., 15(5):553-560, Oct. 9, 1970. 68 refs. Translated from Russian in: Atmospheric Studies at Chemical Enterprises - USSR, p. 153-169, March 9, 1971. Joint Publications Research Services, Washington, D. C.*

NTIS: JPRS-52566

Bionics includes such problems as simulation of the olfactory organs of animate organisms and development of methods of analyzing toxic compounds using biologically active substances such as enzymes. The enzyme method of analysis has found broad application both for indicating poisonous substances with a neuro-paralytic effect and in analyzing low concentrations of organophosphorus insecticides. Various procedures using the cholinesterase reaction are tabulated and an automatic signal for analyzing cholinesterase inhibitors is described. Instruments for measuring odors have also been developed. One is based on measuring the heat of adsorption with a semiconductor thermal resistor coated with an adsorbing film. Another instrument analyzes scent with respect to the variation of the electric current arising as a result of sorption and oxidation of the scent at a liquid-gas interface. A third analyzer operates on the principle of selective adsorption of ultraviolet radiation. The olfactory analyzers should find broad application in industrial facilities.

17469 APTIC NO. 35161

Gold, R. and C. A. Stone

DETECTION OF AIR-BORNE BERYLLIUM DUST. (FINAL REPORT). *Atomic Energy Commission, Oak Ridge, Tenn., Technical Information Service Extension, AEC Contract AT(11-1)346, Proj. A-057, Rept. AECU-3505, 76p., April 25, 1957. 6 refs.*

Present chemical techniques for analyzing minute amounts of beryllium are involved and time consuming. A method is described that uses the yields of neutrons and gamma rays from Be(9) under alpha particle bombardment. Samples of airborne beryllium dust, collected on filter paper, are exposed to Po(210) alpha particles and can be analyzed in a matter of minutes. A 3 by 3-inch NaI(Tl) crystal and low voltage discriminator are used to detect the gamma ray yield which has been correlated with the beryllium content of the filter paper down to approximately 0.2 microgram. This technique should greatly facilitate the evaluation of industrial beryllium dust hazards. (Author abstract modified)

17470 APTIC NO. 35162

Gold, R.

BERYLLIUM-HAZARD DETECTION USING POLONIUM-210 ALPHAS. *Nucleonics, 15(11):114, 117-118, Nov. 1957. 1 ref.*

Present chemical techniques for analyzing minute amounts of toxic airborne beryllium are involved and time consuming. A new method utilizes the high specific activity of polonium (210) alpha decay to determine beryllium in 5-10 min. Samples of airborne beryllium dust are collected on Millipore filter paper and exposed to a flux of Po(210) particles. The gamma-ray yield of the Be(9)(alpha, n gamma)C(12) reaction is then used to analyze the beryllium content of the filter paper. The predominant 4.43-mev gamma transition to the C(12) ground state is detected with NaI(Tl) NaI(tl) crystals.

17471 APTIC NO. 35452

Golikov, V. I.

ON THE CHARACTERISTICS OF A V. G. FESENKOV ACTINOMETER. *(O Kharakteristikakh oreol nogo fotometra V G Fesenkova). Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), no. 223:39-49, 1968. 12 refs.*

An actinometer is described which permits measurement of the spectral transparency of the atmosphere by a method of relative corona. The instrument is a photometer with a fixed viewing angle, selenium photocouple, and exchangable glass light filters. The theoretical basis of the device and its angle characteristics and energy relations are given and the geometric characteristics of various models are shown. Various applications are discussed in determination of radiation flow from the solar corona and the sun, determination of the coefficient of atmospheric transmission and study of the relative thickness of the atmosphere, relative corona, and optical thickness of gaseous atmospheric components.

17472 APTIC NO. 35401

Goulding, F. S. and J. M. Jaklevic

TRACE ELEMENT ANALYSIS BY X-RAY FLUORESCENCE. *California Univ., Berkeley, Lawrence Radiation Lab., Atomic Energy Commission Contract W-7405-eng-48, UCRL-20625, TID-4500, 54p., May 1971. 6 refs.*

NTIS: UCRL-20625

The use of semiconductor detector x-ray fluorescence spectrometers for analysis of trace-element constituents of materials was described. The results illustrate the value of the technique in a wide variety of applications including analysis of food samples, biological specimens, and air filters. Levels of detection in these samples are less than 0.1 ppm. These results are achieved using x-ray excitation of the samples; they can therefore be achieved using only a small laboratory instrument and in a time measured only in minutes. Sample preparation is very simple compared with other techniques of comparable sensitivity. (Author abstract modified)

17473 APTIC NO. 35949

Grennfelt, Peringe

GAS CHROMATOGRAPHIC ANALYSIS OF GASEOUS SULFUR COMPOUNDS IN THE ATMOSPHERE. *(Gaukromatografisk analys av gasformiga svavelforeningar in atmosfaren). Text in Swedish. Lakartidningen, 68(28):3232-3234, 1971. 4 refs.*

Most of the volatile sulfur compounds can be detected by their smell in very low concentrations. There are, however, no methods available for the simultaneous measurement of malodorous materials in concentrations below one ppm. An instrument for the simultaneous measurement of different gaseous sulfur compounds up to a minimum concentration of approximately five ppb was reproduced and tested in Sweden. The instrument represents a special gas chromatograph with an air volume of 10 ml. The air sample is brought by a carrier gas (nitrogen) into the column where separation occurs, depending on the affinity to the gaseous phase contained in the column. The detector is a flame photometer in which the gases are burned in the presence of a hydrogen surplus. Due to a chemiluminescent reaction, the sulfur present in the flame emits light in a wavelength range of 300-423 micron. A filter is inserted between flame and phototube that only transmits the light of the wavelength of 394 + or five micron. The selectivity for sulfur is 10,000-30,000-to-one relative to other substances. The minimum detectable concentration lies at about three ppb. The phototube delivers signals for a one microvolt recorder. This instrument has been used for practical measurements in the surroundings of three sulfate plants when organoleptic tests were carried out at the same time. A correlation factor of 0.6 was found between organolpetic and instrumental testing. The method is being further developed to make detection of concentrations below odor threshold possible.

17474 APTIC NO. 35399

Hagen, Michael F.

ION PUMP POWER SUPPLY. VOLUME 3 OF 6 FOR COMBINED STUDY PROGRAM. FINAL REPORT. *Perkin-Elmer Corp., Pomona, Calif., Aerospace Div., National Aeronautics and Space Administration Contract NAS1-9469, Rept. NASA-CR-111857, P.-E. Rept. SPO-30006, 54p., March 1971.*

NTIS: N71-22871

A high voltage power supply was developed and tested to operate the four l/sec ion pump used in a magnetic mass spectrometer system for monitoring spacecraft atmospheres. A dual mode optimum approach is employed, using two supplies: one for high-voltage/low-current and one for low-voltage/high-current. This provides good efficiency upon starting and running. The system can withstand momentary short circuits on its output without damage. Results of breadboard testing show a maximum measured input power to the ion pump power supply of about 20 watts. Additonal testing with a test load simulating a four l/sec ion pump at a pressure of 1 times 0.001 torr demonstrated the ability to provide sufficient output power capability to reliably start the pump.

17475 APTIC NO. 35737

Hagiwara, Toshiaki

MEASURING APPARATUS FOR TOXIC GASES. *(Yudoku gasu no sokutei kiki ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 38(12):1217-1220, Dec. 1971.*

The principles, mechanism, and characteristics of various toxic gas measurement apparatus and one flue-gas sulfur dioxide analyzer are briefly discussed. One apparatus is specifically for hydrocyanic acid (HCN), hydrogen sulfide (H2S) and chlorine (Cl2) detection. Its principle is the electrochemical reaction between electrolyte and the specific elements in the air. The range of detection is 0-50 ppm for H2S and HCN, and 0-5 ppm for Cl2. The circuit condition is excellent, the battery does not have to be replaced for more than two years, and the electrolyte has to be replenished only once in two weeks or 20 days; it is compact and installation is possible anywhere. The carbon monoxide alarm is often used in a tunnel or an underground parking lot. The sample air is sucked in by a pump and is burned, then the temperature change is detected. The range of detection is 0-500 ppm, the alarm point can be set for less than 50 ppm. It is characterized by compact size and a device which makes the internal installation of an automatic timer possible. The traceable gas ionization analyzer is used mainly for the detection of traceable leakage of such gases as hydrogen chloride, hydrogen fluoride, phosgene, ammonia, and nitrogen dioxide. The mixture of the sample gas and a reagent is led into an ion chamber in an aerosol form, and the decrease of ion current is detected. This analyzer can detect various types of gases by changing the reagent. Depending on the nature of the gas, traceable amounts of ppb order can be detected. There is no danger of effects on human health, and the analyzer may be used without permission.

17476 APTIC NO. 35732

Hamada, Mitsuru

IMPROVEMENTS ON MAINTENANCE OF AUTOMOTIVE EXHAUST GAS MEASURING APPARATUS. *(Haiki gasu sokuteiki no hoshu ni kansuru kaizen). Text in Japanese. Keiryo Kanri, Keisoku Keiso (J. Instrum. Control Assoc. Japan), 20(10):31-33, Oct. 1971.*

Several exhaust gas measurement apparatus are installed in a factory, and 40 to 50 damage incidents per month used to occur regularly. Improvements were made on the maintenance of this equipment by periodical inspections, education and guidance of the personnel, an improvement on the adjustment method of the calculator, and by prevention of oil seepage through the sampling pump. An inspection was given to each instrument every three months, and a general overhauling was given to the sampling system, the analyzer, the optical system, and precision was checked at that time. The orientation course given to all the personnel engaged in handling of the apparatus proved most effective in eliminating incorrect handling and wasteful use of adjustment gas. The adjustment of the calculator, which required two workers, was simplified, so it was possible for one person to take measurements accurately. When the pump was operated for an extended period of time, the temperature and pressure in the crankcase rises and the lubricant oil leaks through the gap between the diaphragm and the bolt. This pollutes the valve and the precision for the measurement of hydrocarbon is lost. An air escape filter was attached to the crankcase so that the pressure would be adjusted, and the oil leakage was prevented. As a result of these improvements, the damage incidents decreased to slightly over 10 per month.

17477 APTIC NO. 35363

Hammer, Josef and Karl Heinz Scherer

METHOD AND INSTRUMENT FOR THE MEASUREMENT OF TRACES OF GASES AND OF VAPORS IN A GASEOUS MEDIUM. *(Verfahren und Vorrichtung zum Messen von Gasspuren in gasfoermigen Medien, insbesondere von aggressiven Gasen und Daempfen). Text in German. (Chemie-Technik G.m.b.H, Frankfurt (West Germany)) Ger. Pat. 1,808,055. 9p., May 27, 1970. (Appl. Nov 9, 1968, 4 claims).*

The method separates a trace gas from its gaseous medium by washing with a liquid reacting with the trace gas; the difference between the conductivity of the washing liquid before and following reaction with the trace gas is a measure of trace gas quantity. Only a single trace gas can be measured; if a gas contains several trace gases the others must first be separated. The washing liquid passes through an ion exchanger (with anion and cation exchange resins) before reacting with the gas to permit repeated use; only its losses must be replaced periodically. Two pairs of electrodes measure the conductivity of the reaction fluid before and following the reaction with a measured volume of the contaminated gas (a 0.001 N-0.01 N solution of sodium arsenate in the case of chlorine); the difference, recorded automatically by an appropriate electronic device, indicates the quantity of the trace gas. Since conductivity changes with temperature, a constant temperature must be maintained in the instrument. The instrument consists of a storage vessel for washing liquid, a pump for the circulation of the liquid, an ion exchanger, reactor, gas and liquid proportioner, and two pairs of electrodes with the necessary recording equipment.

17478 APTIC NO. 35265

Hass, G. C.

SOURCE TESTING OF MOTOR VEHICLES. *Preprint, California Air Resources Board, Sacramento and California State Dept. of Public Health, 12p., 1971. 2 refs. (Presented at the Conference Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

Sampling and analytical technology of motor vehicle emission testing and officially prescribed procedures are reviewed. Four distinct emission sources from a single vehicle are involved: the crankcase vent, carburetor hot soak loss, fuel tank evaporation, and the exhaust pipe, emitting hydrocarbons, carbon monoxide, nitrogen oxides, lead, aldehydes, oxygenate particulate matter, polynuclear hydrocarbons, sulfur dioxide, carbon dioxide, and ammonia. Factors affecting measurement include exhaust gas flow rate, contaminant concentration, and engine cycles. Exhaust emissions are currently measured by a dynamometer, trap, and filter prior to analysis by nondispersive infrared analyzer; constant volume sampling as a substitute is discussed. The flame ionization method for hydrocarbon analysis is also considered.

17479 APTIC NO. 35320

Hochheiser, Seymour, Franz J. Burmann, and George B. Morgan

ATMOSPHERIC SURVEILLANCE: THE CURRENT STATE OF AIR MONITORING TECHNOLOGY. *Environ. Sci. Technol., 5(8):678-684, Aug. 1971. 6 refs.*

Criteria for selecting monitoring instruments and methods are discussed, and the current stage of monitoring technology is described. Reference methods and sample-averaging times specified for national air quality standards are indicated. Common techniques used to collect integrated samples in the field are discussed. Over 70 commercial continuous automatic instruments are listed for monitoring pollutants for which national ambient air quality standards exist. Their cost range and detection principle is also stated. Pollutants covered by these instruments are sulfur dioxide, oxidants, carbon monoxide, total hydrocarbons, methane-CO-total hydrocarbons, and nitrogen dioxide-nitrogen oxides. Also shown are sampling and analytical methods for monitoring potentially hazardous or detrimental pollutants, e.g., mercury, beryllium, cadmium, asbestos, radioactive materials, pesticides, fine particulates. Research and development needs for continuous monitoring are discussed. Methods given include colorimetry, hi-vol samples, infrared spectrometry, chemiluminescence, flame ionization, impactor, and membrane filter.

17480 APTIC NO. 35831

Houben, William P.

HYDROCARBON ANALYSIS IN AUTO EXHAUST BY VARIOUS INSTRUMENTAL METHODS. *Anal. Instrum., no. 9:D-3-10 to D-3-7. 8 refs.*

Operating principles and relative sensitivities are reported for the different types of analytical instruments used to measure hydrocarbons in automobile exhaust. The non-dispersive hexane infrared analyzer, the hydrogen flame analyzer, the ultraviolet analyzer, and a new infrared photometer were investigated. The NDIR hexane analyzer is best suited to meet present state and federal hydrocarbon emission legislation and must be considered as the primary source of test information. The new infrared photometer, because of its relative sensitivity similar to NDIR and its lower cost, is currently recognized as an ideal instrument for test lanes and diagnostic work in garages. The hydrogen flame analyzer will have a greater future importance due to its ability to detect very low levels of hydrocarbons. The ultraviolet analyzer might have some advantage in determining smog potential, since its primary sensitivity is for olefins and aromatics. It cannot be used for compliance with present emission legislation, however, unless corrected with NDIR. (Author conclusions modified)

17481 APTIC NO. 35966

Iriondo, Josquin Marcoerqueaga

AIR ANALYZER. *(Analyseur d atmosphere). Text in French. (Assignee not given.) Swiss Pat. 503,990. 3p., April 15, 1971. (Appl. Dec. 9, 1969, 5 claims).*

The air analyzer is described that permits automatic control of a gas flow regulating valve. Earlier designs of apparatus for a similar purpose comprise a metastable flame that acts upon a thermocouple, which in turn develops an electromotive force to energize an electromagnet which actuates the gas flow regulating valve. Difficulties encountered with these analyzers are caused by the delicate equilibrium between flow velocity of the combustible and speed of combustion, and the possibility of incorrect placement of the thermocouple, air drafts, and other problems. The present invention overcomes these difficulties by providing a device which does not depend on a metastable flame. The analyzer includes a burner that has an annular-shaped forward combustion end and that incorporates a thermocouple as a heat-sensible element located in the central part of the burner. When combustion occurs under normal conditions, the flame has the form of a crown and the tip of the thermocouple is enveloped by the reductive hot zone of the flame. When the atmosphere in which combustion takes place attains a predetermined concentration of carbonic anhydride, the form of the flame changes in such a manner that the tip of the thermocouple is in the coldest zone of the flame and becomes de-energized. This condition, in turn, affects the electromagnet and its control of the flow-regulating valve.

17482 APTIC NO. 35205

Jacobson, Murray and Samuel L. Terry

A METHOD FOR SAMPLING AND ANALYZING TRONA DUST. *Bureau of Mines, Pittsburgh, Pa., Coal Mine Health and Safety and Bureau of Mines, Pittsburgh, Pa., Safety Research Center, Rept. of Investigations 7506, 4p., April 1971. 1 ref.*

NTIS: PB 199039

At present, a gravimetric technique is used for evaluating the environmental atmosphere in trona mines. This technique, although highly efficient, requires long sampling periods. A short-term procedure using a midget impinger is described. Trona dust (composed of sodium carbonate and bicarbonate) is collected in distilled water, and the relative concentration is determined by titrating to an end point with 0.1 N hydrochloric acid solution. The mass concentration of the trona sample is determined from a calibration curve relating the volume of acid required for neutralizing a collected sample to the mass of the dust. Test data indicate that the sampling procedure produces equivalent mass concentrations that are the same as those obtained by gravimetric sampling.

17483 APTIC NO. 35632

Joubert, J. D.

CONSIDERATIONS ON THE VARIOUS METHODS FOR CHARACTERIZING AIR POLLUTION. *(Remarques sur les differentes methodes pour caracteriser la pollution de l air). Text in French. Poumon Coeur (Paris), 26(6):629-632, 1970.*

The difficulties in characterizing atmospheric dust pollutants are discussed. The chemical composition and electrostatic properties of the particles are important: the greater the electric charge, the easier it is to trap the dust particles. A simple determination method consists of allowing a large volume of air to pass through a filter and then analyzing the material retained on the filter using physical and chemical methods. This technique allows evaluation of the total particle concentration in the air but does not indicate the form the particles existed in the atmosphere, information of fundamental importance for the study of the effect of pollutants on man. Instead of weighing the particles deposited on the filter membrane, another method consists of determining the opacity of the membrane before and after air sampling, the difference between the two readings is a measure of the dust concentration, using the Ringelmann of Bacharach scales for certain types of dust. The results must be interpreted with caution. A third method consists of dissolving the membrane in a suitable solvent, and, after ultrasonic disperson, making a numerical granulometric analysis with a Coulter counter.0 However, distorted readings of particle sizes are possible. The ideal method is not to take samples at all, but to measure the particles in situ, using the quantity of light diffused by a particle as a basis for determining the particle size. This method permits detection of particles above 0.3-micron size. The necessary apparatus is delicate and costly.

17484 APTIC NO. 35263

Karels, Gale G.

IMPROVED SAMPLING METHOD REDUCES ISOKINETIC SAMPLING ERRORS. *Preprint, California Air Resources Board, Sacramento, and California State Dept. of Public Health, 14p., 1971. 4 refs. (Presented at the Conference on Methods in Air Pollution and Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

A particulate sampling system is described which reduces isokinetic sampling errors by using a metering system to reduce the number of variables in the sampling rate equation to two. This creates a direct relationship between sampling rate and stack velocity. The filter probes and isokinetic sampling nozzles are glass; the nozzle is located adjacent to the pitot tube tips. The method is practical and inexpensive, and rates within 98% of the apparent true isokinetic rate are frequently obtained.

17485 APTIC NO. 35337

Kim, Young Ho and John N. Pattison

GAS ANALYZER. *(American Bosch Arma Corp., Garden City, N. Y.) U. S. Pat. 3,586,486. 10p., June 22, 1971. 4 refs. (Appl. Feb. 23, 1968, 13 claims).*

A catalytic combustion type gas analyzer which mixes gas and air in a selected ratio is examined. The mixture is passed over a pair of electrically heated resistance elements, only one of which is catalytically alive, connected in a Wheatstone bridge measuring circuit. Any combustible gas in the sample is oxidized at the catalytic surface of the active element, producing an element temperature rise proportional to the percentage of combustible gas, thereby unbalancing the Wheatstone bridge. The elements utilize a ceramically coated electrical conductor, over which a glass seal is formed. An aluminum or beryllium oxide coating covers the glass seal; the catalytically active element has a catalytic coating over the oxide coating. (Author abstract modified)

17486 APTIC NO. 35160

Kobayasi, Takao and Humio Inaba

LASER-RAMAN RADAR FOR AIR POLLUTION PROBE. *Proc. IEEE (Inst. Elec. Electron. Engrs.), 58(10):1568-1571, Oct. 1970. 13 refs.*

As an experimental verification of a novel application of the laser-Raman radar, frequency-shifted Raman components of a Q-switched ruby-laser pulse from atmospheric molecular gases and from chemicals in an oil plume were analyzed selectively. The power ratio of the Raman-shifted component to the unshifted was estimated under various meteorological conditions by calibrating the filter response and the spectral response of the photomultipliers. In the hazy or foggy atmosphere, pronounced decreases in the power ratios due to enhancement of the Mie scattering were observed. The unshifted light should therefore be attenuated by a factor of 10 to the 7th power to 10 to the 9th power in the hazy or foggy atmosphere if spurious contributions to the Raman-shifted components of the atmospheric nitrogen or oxygen molecules are to be avoided. To within an experimental error, each wavelength for maximum power agreed with the theoretical values of the Q branches of the vibrational-rotational Raman bands of five molecules such as sulfur dioxide, carbon dioxide, oxygen, carbon monoxide, and nitrogen.

17487 APTIC NO. 35605

Kryukov, G. I. and S. L. Simkina

PHOTOELECTRIC GAS ANALYZERS. *Zh. Vses. Khim. Obshchestva im. D. I. Mendeleeva, 15(5):493-499, Oct. 9, 1970. 13 refs. Translated from Russian in: Atmospheric Studies at Chemical Enterprises - USSR, p. 23-38, March 9, 1971. Joint Publications Research Service, Washington, D. C.*

NTIS: JPRS-52566

Photocolorimetric gas analyzers come in liquid and strip versions. The latter are more widely used since they are structurally less awkward, do not require special auxiliary devices for preparing the liquid analysis, and permit broad standardization. Their low cost, reliability, and operating convenience should extend their application to analyzing microconcentrations of toxic agents in the air of production facilities. Photoelectric devices for recording the variation of the radiant flux and converting it into an electric signal are direct conversion photometers, differential photometers, and compensation photometers. Representatives from each category are schematically illustrated. Compensation photometers, in which it is possible to limit errors connected with the effect of external factors and instability of the characteristics of photoreceivers, radiation sources, amplifiers, and output devices, have the greatest accuracy. Definable component and measurement limits and other characteristics are given for foreign and Soviet photocolorimetric gas analyzers.

17488 APTIC NO. 35091

Kummer, W. A., J. N. Pitts, Jr., and R. P. Steer

CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES. *Environ. Sci. Technol., 5(10):1045-1047, Oct. 1971. 10 refs.*

Homogeneous gas-phase chemiluminescent reactions of ozone with olefins and organic sulfides were investigated to determine the possibility of using the reactions as a sensitive quantitative method of ozone analysis. Chemiluminescence spectra from the reactions of ozone with ethylene, trimethylethylene, tetramethylethylene, dimethyl sulfide, and hydrogen sulfide were recorded and the integrated emission intensities relative to ethylene were calculated. Ethylene had the lowest integrated emission intensity of the compounds tested. The feasibility of quantitative determination of trace amounts of sulfur-containing pollutants by means of their reactions with ozone was also discussed.

17489 APTIC NO. 35491

Kummer, W. A., J. N. Pitts, Jr., and R. P. Steer

CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES. *Environ. Sci. Technol., 5(10):1045-1047, Oct. 1971. 10 refs.*

Chemiluminescence spectra from the gas-phase reactions of ozone with several olefins and organic sulfides in the mm-pressure range were recorded and the integrated emission intensities relative to ethylene calculated. The emission from the ethylene-ozone reaction produced a weak signal extending from 300 to 650 nm with a peak at 440 nm. A relatively intense luminscence was found for trimethylene and tetramethylene-ozone reactions. These spectra each exhibited a peak at about 520 nm with broad shoulders at 465 and 565 nm. Spectra for the reactions of ozone with dimethylsufide and hydrogen sulfide both had peaks at 370 nm and half widths of about 10 nm. All compounds tested had higher integrated emission intensities than ethylene, the compound presently used in chemiluminescent ozone detectors. Their substitution for ethylene could extend the sensitivity of this monitoring method, which now detects ozone in the sub-part per-million range. The quantitative determination of trace amounts of sulfur-containing pollutants by means of their chemiluminescent reactions with ozone may also be possible.

17490 APTIC NO. 35167

Link, W. T., E. A. McClatchie, D. A. Watson, and A. B. Compher

A FLUORESCENT SOURCE NDIR CARBON MONOXIDE ANALYZER. *Preprint, California Air Resources Board, Sacramento and California State Dept. of Public Health, 7p., 1971. (Presented at the Conference Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

A fluorescent nondispersive infrared carbon monoxide analyzer is described which extends the lower useful sensitivity range of commercial analyzers by a factor of 10, while simultaneously increasing stability and specificity. The main advantages of the analyzer over commercial analyzers include the fluorescent source which increases the high rejection ratio of interfering gases; a single tube for both sample and reference signals; a semiconductor detector which is not subject to error from shock and vibration; easy maintenance; and small size. No elaborate sample collecting apparatus is required; in extremely dirty environments, a simple filter may be used.

17491 APTIC NO. 35450

Lugg, G. A. and A. S. Wright

THE DETERMINATION OF TOXIC GASES AND VAPOURS IN AIR. *Australian Defence Scientific Service, Maribyrnong, Defence Standards Lab., Circ. 14, 2nd ed., 49p., April 1955. 23 refs.*

Basic principles of operation, apparatus, reagents, calibration, efficiency, sensitivity, and specificity are reviewed for various methods of determining toxic gases and vapors in the atmosphere. Methods for ammonia, amyl acetate, aniline, arsine, butyl acetate, carbon monoxide, carbon tetrachloride, chloroform, chromic acid, ethylene dichloride, ethyl acetate, formaldehyde, hydrogen cyanide, mercury vapor, nitroglycerin, nitrous fumes, ozone, sulfur dioxide, tetrachlorethane, tetrachlorethylene, and trichlorethylene included colorimetry and iodimetric methods, using bubblers, pumps, flowmeters, and absortiometers.

17492 APTIC NO. 35494

Lundgren, Dale A.

DETERMINATION OF PARTICULATE COMPOSITON, CONCENTRATION AND SIZE DISTRIBUTION CHANGES WITH TIME. *Atmos. Environ. (London), 5(8):645-651, Aug. 1971. 2 refs. (Presented at the Symposium on Advances in Instrumentation for Air Pollution Control, Cincinnati, Ohio, May 26-28, 1969.)*

A method for determining timewise fluctuations in size, concentration, and chemical composition of atmospheric particulates 0is described. The method is based on sampling, at flow rates from 0.5 cu ft/min to five cub ft/min, with a four-stage impactor. Particles are collected by inertial impaction on a rotating drum coated with a thin film material, preferably Teflon. Film deposits can be examined by techniques such as infrared absorption spectroscopy or X-Ray diffraction. Deposit density changes or composition changes can sometimes be read directly off the film, thus giving composition or concentration changes as a function of time within each of the various particle size ranges. Normally, particulate matter is removed from the film for analysis. Water is used, for example, to determine the presence of sulfates, nitrates, acid, or elements such as lead or iron. Electron microscope grids can also be attached directly to the drum for subsequent viewing, or for analysis of individual particles by electron microscope or particulate crystals by electron diffraction. Analytical results for total particulate, sulfate, nitrate, lead, and iron are given for 10 separate impactor samples. Estimates of each sample mass mean diameter and geometric standard all data are reasonably accurate.

17493 APTIC NO. 35648

MacKay, Donald A. M., David A. Lang, and Murray Berdick

OBJECTIVE MEASUREMENT OF ODOR: IONIZATION DETECTION OF FOOD VOLATILES. *Anal. Chem., 33(10):1369-1374, Sept. 1961. 14 refs. (Presented at the American Chemical Society, Division of Agricultural and Food Chemistry, Meeting, 135th Boston, Mass., April 1959.)*

Volatiles in various foods, beverages, and flavoring materials were directly analyzed with gas chromatographic ionization detectors. The sensitivity of the detectors (10 to minus the 12th power or 10 to minus the 14th power/mole) make possible the breakdown of odors into their various components. Typical chromatograms are given for vapors from peppermint oils, fresh and imitation banana, brewed and roast coffee; brandy; various whiskies; onion volatiles; and cigar and ciagarette smoke. With the ionization detection technique, direct correlation with sensory evaluation is possible. Moreover, the sensitivity of the method allows a lower temperature to be used and the concentration step to be circumvented in many cases. Instead of working with 10 to 100 ml of liquid concentrates, from one to five ml of vapor samples can be used. The techniques described are equally applicable to odor problems in perfumery and air pollution.

17494 APTIC NO. 35319

Maly, Ernest

A METHOD FOR THE DETERMINATION OF POLYCYCLIC HYDROCARBONS IN AIR-BORNE PARTICULATES FROM URBAN AND OTHER ATMOSPHERES. *Mikrochim. Acta., no. 5:800-806, 1971. 14 refs.*

A paper-chromatography solvent system was developed for the semiquantitative determination of polycyclic hydrocarbons in particulates. Whatman air-sample filters were extracted six times with benzene and the united extracts evaporated in a special vessel. Total solids were concentrated in the conical tip of the vessel, then dissolved in benzene. Microliter aliquots were applied to Whatman No. 4 paper, impregnated with medicinal paraffin. Methanol saturated with medicinal paraffin was used as the ascending mobile phase, and chromatograms were run for five hours at room temperature. Partly separated spots were evaluated with calibration curves prepared with pure hydrocarbons and through measurement of the horizontal diameter of the spots, which were inspected under ultraviolet illumination. While weakly fluorescing hydrocarbons were difficult to determine even semiquantitatively, strongly fluorescing hydrocarbons were easily seen and delineated. The procedure is not rapid, but the actual working time is short (Author summary modified)

17495 APTIC NO. 35351

Mannering, M. H. and M. C. Mannering

A DUST COLLECTING APPARATUS OF SIMPLE CONSTRUCTION. *Med. Lab. Technol., 28(4):397-399, Oct. 1971. 2 refs.*

An apparatus for the collection of dust for subsequent analysis is described. Dust is extracted from the air flow created by a vacuum cleaner onto a standard filter paper enclosed in a filter assembly. The construction of the filter assembly is examined. (Author abstract modified)

17496 APTIC NO. 35723

Matthews, K. J., M. K. Parr, and G. R. Stern

A WATER-COOLED SMOKE METER FOR THE ESTIMATION OF SOOT CONCENTRATIONS IN NATURAL GAS FLAMES. *J. Inst. Fuel, 42(342): 275-278, July 1969. 4 refs.*

A water-cooled smokemeter probe for determining carbon concentrations in natural gas flames consists of a water jacket and a sampling tube, which fits inside the water jacket and carries the filter paper. The axial position of the sampling tube in the water jacket can be varied to control the temperature of the gases at the filter paper. As determined by calibration tests, the probe is accurate to within plus or minus 25% for Shell smoke numbers between 3.0 and 9.0 and covers soot concentrations from two to 400 micrograms. By reducing sampling flow rate to 250 cc/min, this range can be extended to four microgram/liter. At a flow rate of 2.5 1/min, a sampling time of five seconds is possible, provided the sampling tube is inserted well into the carrier tube. The probe water jacket can also be used to obtain samples of combustion gases for analysis.

17497 APTIC NO. 35713

McClintock, Michael, T. A. Hariharan, and Akden McLellan, IV

STUDIES ON TECHNIQUES FOR SATELLITE SURVEILLANCE OF GLOBAL ATMOSPHERIC POLLUTION. (FINAL REPORT). *Wisconsin Univ., Madison, Space Science and Engineering Center, National Air Pollution Control Administration Contract CPA 22-69-101, Rept. APTD-0672, 91p., Sept. 30, 1970. 99 refs.*

NTIS: PB 198821

The feasibility of using satellites to study air pollution was analyzed with respect to remote sensing of particulates; turbidity from sun-glitter observations; turbidity from Applications Technology Satellite (ATS) measurements; techniques for the remote sensing of gaseous pollutants; measurement of carbon monoxide from Geosynchronous Meteorological Satellites (SMS); and the application of lasers to air pollution research. With the exception of the ATS measurements, each of these areas is still in the concept stage. The most promising subjects to pursue further for quantitative evaluation are two experiments designed to measure the variation of albedo and of atmospheric turbidity in the spectral regions important to the radiative energy balance of the planet. These quantities can be measured with greater precision than they can be calculated using indirect measurements, and satellite-based experiments could provide measurements on a global scale at lower cost than a network of ground stations. An initial effort in this direction was an attempt to detect air pollution in the Los Angeles basin from Existing ATS-III data. The results are discussed.

17498 APTIC NO. 35695

McCrone, Walter C.

MICROSCOPY AND POLLUTION ANALYSIS. *Am. Lab., 1970:8-10, 12, July 1970.*

The use of microscopy in the identification of particulate pollutants is discussed. Single particles of almost any size can be identified by the trained microscopist. The lower limit is about one picogram with the light microscope, one femtogram with the scanning electron microscope, one attogram with the transmission electron microscope, and even smaller with the ion probe. The size, shape, color, transparency, homogeneity, polarization colors, and refractive indices are used as the basis for identification. Automobile exhaust contains traces of lead identifiable as specific lead compounds in a matrix of engine-wear debris, partly burned fuel and oil, and oil additives. The microscopist can isolate these lead compounds using the microprobe to determine the anion involved and the stoichiometry. The use of microscopy in water pollution is also discussed. The microscopist is the only analyst able to analyze a general pollution sample, particle by particle, or to identify a ppb of asbestos dust or quartz in any sample. This is the background needed to solve pollution problems, since only when the pollutants can be identified and traced to their respective sources can pollution be controlled.

17499 APTIC NO. 35657

McKee, Herbert C.

MEASUREMENT OF FUGITIVE DUST EMISSIONS AND VISIBLE EMISSIONS. *Preprint, California Air Resources Board, Sacramento and California State Dept. of Public Health, 14p., 1971. 3 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

The Texas Air Control Board has modified available measurement methods to establish new emission standards for fugitive dust and visible emissions. Fugitive dust emissions, i.e., dust from sources other than a stack or duct, can be measured with a high volume sampler located downwind of the source and a second sampler located upwind. The net difference between the two samples is the contribution of the source in question. A calibration procedure was developed using an optical instrument to determine compliance with a legal standard relating to visible emissions. Measurements are continuous on a 24-hour basis.

17500 APTIC NO. 35136

Melnikova, L. V. and A. A. Belyakov

DETERMINATION OF ATRAZINE, CYANURCHLORIDE, HYDROGEN CYANIDE AND ALIPHATIC AMINES IN THE AIR. *(Opredeleniye atrazina, Tsianurkhlorida, Tsianistogo vodoroda i alifaticheskikh aminov v vozdukhe). Text in Russian. Gigiena i Sanit., no. 9:67-69, 1971. 1 ref.*

Methods for the determination of atrazine cyanuric chloride, hydrogen cyanide, and aliphatic amines in air samples are described. Atrazine dust samples are passed through filter paper where the dust to be analyzed is trapped. Quantitative determination is carried out by photometry of its reaction product with aniline and pyridine. Ethylamine and isopropylamine produce no interference and cyanuric chloride is not retained by the filter paper. Separate determination of cyanuric chloride compound is required when present in amounts exceeding five percent in the air sample. The method of its determination is based on the difference in its reaction kinetics with pyridine compared to those of atrazine. A simplified method of hydrogen cyanide determination consists of its conversion into cyanogen chloride during the sample collecting process and the measurement of the generated amounts of glutaconic aldehyde dianilide. A color reaction for the determination of aliphatic amines (and ammonia) with 1,4-benzoquinone and photometry at 432-436 millimicron is described. Atrazine produces no interference. The preparation of standard solutions for all the above mentioned photometric determinations is described.

17501 APTIC NO. 35951

Meyer, P. B. and J. F. Van Der Wal

COMPARATIVE MEASUREMENTS OF AIR POLLUTANTS IN THE IRON AND STEEL INDUSTRY OF FIVE MEMBER-COUNTRIES OF THE EUROPEAN COAL AND STEEL COMMUNITY. *TNO Nieuws, 26(11):547-554, Nov. 1971. 11 refs.*

Dust concentrations are determined in relation to the risk of silicosis, with regard to various working places in the iron and steel industry, in Belgium, Western Germany, Italy, Luxemburg, and the Netherlands. Both the type and the quantity (dose) of the polluting agent taken up by persons determines the damage to the human organism. Determination of the concentration of dust in inhaled air is attended with difficulties which become particularly evident when several institutes perform measurements with the intention of comparing results. These difficulties are due to the sampling system, ususally carried out by sucking a known quantity of air through a sample collection device. In this process the dust is separated from the air. As the inert and heavy mass of the dust particles flowing into this device can generally not be neglected, the quantity of the dust separated will depend on the speed pattern of the air around the device. This speed pattern, in turn, depends on the characteristics and the geometry of the sampling device. As each research institute develops its own measuring equipment with its own characteristics, the results of the measurements of different institutions cannot be compared without first establishing correlation factors. In view of these problems, investigations were undertaken to establish correlation factors between the measuring results of instruments exposed to identical dust concentrations. Measurement methods tested included a membrane filter, thermal precipitator, hi-vol sampler, filter, impinger, and a dust classifier.

17502 APTIC NO. 35277

Moffat, Andrew J. and Millan M. Millan

THE APPLICATIONS OF OPTICAL CORRELATION TECHNIQUES TO REMOTE SENSING OF SO2 PLUMES USING SKY LIGHT. *Atmos. Environ. (London), 5(8):677-690, Aug. 1971. 7 refs. (Presented at the Symposium on Advances in Instrumentation for Air Pollution Control, Cincinnati, Ohio, May 26-28, 1969.)*

A correlation spectrometer for the passive remote sensing of sulfur dioxide in stack plumes is described, and instrument calibration and operating theory, including the effect of atmospheric scattering on instrument response, are discussed. Initial results are presented for a series of measurements at different ranges for thermal generating station and oil refinery stacks. The general procedure of plume measurement involves aiming the sensor off to one size of a plume, i.e., against the background sky, and zeroing instrument output. Two reference cells are then inserted in turn and the deflections noted. The field of view is then scanned slowly through the plume as close to the stack exit as possible and the maximum reading noted. Because the incremental sensitivity of the sensor is measured using the background sky and the reference cells, the instrument is calibrated for the sky and atmospheric conditions prevailing at the time of each plume measurement. The field measurements indicate that this measuring technique is practical and viable within defined operation limits.

17503 APTIC NO. 35840

Moffitt, A. E., Jr. and R. E. Kupel

A RAPID METHOD EMPLOYING IMPREGNATED CHARCOAL AND ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR THY DETERMINATION OF MERCURY. *Am. Ind. Hyg. Assoc. J., 32(9):614-620, Sept. 1971. 15 refs.*

A quantitative procedure for the determination of submicrogram quantities of mercury in atmospheric, biological, and aquatic samples is examined. For determinations of atmospheric mercury, volatile mercury metal and mercury compounds can be analyzed separately. The total analysis time is less than three minutes, and the minimum detectable quantity of mercury is 0.02 micrograms. The technique consists of driving the sample through impregnated charcoal and direct analysis of the integrated samples with an atomic absorption sampling boat assembly. Experimental apparatus, standard solutions, preparation of the standard curve, and operational procedures are discussed.

17504 APTIC NO. 35623

Nader, John S.

DIRECT-READING INSTRUMENTS FOR ANALYZING AIRBORNE GASES AND VAPORS. *Preprint, Air Pollution Control Office, Research Triangle Park, N. C., Div. of Chemistry and Physics, 36p., 1971. 14 refs.*

Physical and chemicophysical instrumentation for the physical detection and analysis of airborne gases and vapors is reviewed. Methods include electrical detection (e.g., conductivity, potentiometry, coulometry, ionization), radioactive tracers; thermal detection by specific heat of conductance and heat of combustion; electromagnetic techniques analysis of molecular phenomena, spectroscopy, interferometry, correlation, derivative methods, and transform techniques; chemi-electromagnetic techniques (colorimetry and photometric (chemiluminescent) methods); magnetic analysis; and gas chromatography.

17505 APTIC NO. 35269

Nelson, William G.

CORRECTION OF ANISOKINETIC SAMPLING ERRORS. *Preprint, California Air Resources Board, Sacramento and California State Dept. of Public Health, 9p., 1971. 5 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

The aerosol content of a flowing gas stream is usually measured by weighing the aerosol particles collected from a known volume of gas-aerosol mixture. Gas flow patterns for isokinetic sampling, for sampling velocity greater than free stream velocity, and for sampling velocity less than free stream velocity are delineated. Theoretical sampling efficiencies resulting from non-isokinetic sampling for particles with inertia parameters between two extremes are calculated according to the method of Vitols. As actual conditions move away from conditions assumed according to Vitols, the actual collection efficiency moves closer than predicted to the velocity ratio. Another deviation is introduced by considering a polydisperse aerosol as monodisperse. If the mean aerosol diameter is treated, the predicted mass sampling ratio was lower than expected for sampling velocity ratio greater than unity. The potential error was brought to acceptable limits by decreasing the size range considered for each calculation.

17506 APTIC NO. 35607

Niki, H., A. Warnick, and R. R. Lord

AN OZONE-NO CHEMILUMINESCENCE METHOD FOR NO ANALYSIS IN PISTON AND TURBINE ENGINES. *Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1971. 2 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710072.)*

A method to measure nitric oxide in photochemical smog research was developed using the chemiluminescence from the rapid reaction between ozone and NO, and an instrument based on this method was constructed. The reactor is a stainless steel cylinder sealed on one end with an optical filter and attached to a photomultiplier housing. The other end of the reactor connects to a vacuum system. Metered quantities of NO and 03 are mixed and introduced into the reactor in a region close to the optical filter. The signal resulting from the reaction and detected by the photomultiplier is amplified in a parametric electrometer, which has selectable ranges of 1-10,000 ppm equivalent NO concentration. This NO detector was tested extensively in both laboratory and dynamometer experiments, and was shown to have several outstanding features: detection sensitivity of 0.01-5000 ppm, selective detertion for NO, continuous monitoring with fast response time, and good stability and ease of operation. Examples of results obtained in turbine experiments and in vehicle exhaust analysis are presented.

17507 APTIC NO. 3506

Olin, John G. and Gilmore J. Sem

PIEZOELECTRIC MICROBALANCE FOR MONITORING THE MASS CONCENTRATION OF SUSPENDED PARTICLES. *Atmos. Environ., vol. 5:653-668, 1971. 13 refs. (Presented at the National Air Pollution Control Administration, Symposium on Advances in Instrumentation for Air Pollution Control, Cincinnati, Ohio, May 26-28, 1971.)*

The feasibility of a piezoelectric microbalance for measuring the mass concentration of suspended particles was examined. The microbalance consists of a vibrating piezoelectric crystal driven by a standard oscillator circuit; the crystal oscillates with a very high stability at its resonant mechanical frequency. A collector, e.g., impactor or electrostatic precipitator, deposits the suspended particles onto the electrode surface of the vibrating crystal and the resonant frequency shifts downward linearly with the added mass of the particles. The time rate of change of the frequency is proportional to the mass concentration of ambient suspended particles. Experimental and theoretical mass sensitivities were identical. With an electrostatic precipitator sampling at 1.1/min, the total mass concentration was measured to within + or five percent in 41 sec. Experiments with an impactor collector determined the diurnal variation of the mass concentration, showing decay in the evening and a steep rise during working hours. (Author abstract modified)

17508 APTIC NO. 35518

Persiani, Carmine

THE DETECTION OF SELECTED AIR POLLUTANTS USING A LABORATORY NEUTRON GENERATOR. *Am. Ind. Hyg. Assoc. J., 32(9):573-578, Sept. 1971. 3 refs.*

Neutron activation analysis was employed to determine aluminum, silicon, chlorine, mercury, vanadium, manganese, and bromine in air particulates. All irradiations of filter-paper samples were performed with a Cockcroft-Walton accelerator. Neutrons of 14 MeV were first used for the activation analysis. Severe interferences due to the high background contribution of the paper were encountered in the measurement of photopeaks of vanadium, manganese, and bromine. Thermal neutron activation analysis of the filter paper produced considerably less background activity and appears preferable for the detection of a greater number of elements. The results by neutron activation are compared to those obtained by emission spectrography. Neutron activation offers several advantages in that it is nondestructive and rapid, and sample dissolution, separation, and ashing are eliminated. However, the method is limited to elements possessing large neutron cross sections and having convenient half-lives.

17509 APTIC NO. 35485

Piepenbrink, Winfried

PHOTO-ELECTRONIC SMOKE DENSITY METER. *(Photoelektronisches Rauchidichtemessgeraet). Text in German. (Assignee not given.) W. Ger. Pat. 1,623,071. 4p., Sept. 9, 1971. 1 ref. (Appl. Feb. 3, 1967, 3 claims).*

A photo-electronic smoke density meter is examined. The system consists of a light source, a beam optics and radiation receiver on one side of a smoke channel, and a reflector on the other side. A second reflector can be positioned into the beam on the light source side for null point control by deflection to the receiver. 0

17510 APTIC NO. 35313

Prager, Manfred J.

POLLUTION MONITORING BY FLAME EMISSION SPECTROSCOPY. *Opt. Spectra., 5(8):28-31, Oct. 1971. 8 refs.*

Direct monitoring by emission spectroscopy requires an excitation source, a sampling system to gather the analytical sample and introduce it into the source, means to isolate the characteristic radiation of the substance to be measured, a detector to measure the emitted radiation, and a data processing and display system. Flame photometric instruments have already been used for monitoring air or water for sulfur, phosphorus, and chlorine compounds. Individual pollutants containing these elements have been identified and determined by combining flame emission detectors with gas chromatographs. Narrow-band interference filters are generally used to isolate the spectral region of analytical interest. Optical chopping has been employed to promote zero stability by compensating for variations in the flame background.

17511 APTIC NO. 35542

Reynolds, L. Todd

A RELAY CONTROL TO IMPROVE OPERATION OF AISI-TYPE AUTOMATIC AIR SAMPLERS. *Rev. Sci. Instr., 42(5):731, May 1971.*

Air sampling machines which use edge-punched filter paper tapes are extensively utilized in air quality studies. The tape advance drive motor in typical models of this device is controlled by two switches in parallel. A timer mechanism closes one switch for one-to four sec duration at the end of sampling intervals. The second switch is then closed by contact with the moving tape, remaining closed until a punched indexing hole passes under the switch feeler. Malfunctions may take place which lead to defective synchronization of tape segments with the time intervals of sampling. Installation of a relay logic circuit will allow the tape to advance one and only one segment each time a new signal pulse is received from the timer switch.

17512 APTIC NO. 35348

Rosa, Charles N. La, Manfred J. Prager, and Joseph L. Kalinsky

DETECTION OF TOXIC ORANOPHOSPORUS AIRBORNE SUBSTANCES BY FRUSTATED MULTIPLE INTERNAL REFLECTION SPECTROSCOPY. *(Dept. of the Navy) U. S. Pat. 3,582,209. 6p., June 1, 1971. 4 refs. (Appl. Nov. 14, 1968, 1 claim).*

A spectroscopic method for the detection of toxic organophosphorus airborne substances in examined. The system consists of a thin germanium crystal prism in the form of an isosceles trapezoid or parallelogram whose base surface and opposite parallel side are coated with platinum about 70 millimicron thick. The sample is flowed across the base and the opposed surface of the crystal while infrared of wavelength band 9-10 micron is directed through the crystal for multiple internal reflection; the amplitude of the infrared is monitored. (Author abstract modified)

17513 APTIC NO. 35627

Rumpf, H., W. Alex, R. Johne, and K. Leschonski

A CRITICAL OBSERVATION ON METHODS FOR ANALYSIS OF THE SIZES OF FINE PARTICLES. *(Korngroessenanalyse feiner Teilchen, eine kritische Betrachtung der Methoden). Text in German. Deut. Bunsenges. Phys. Chem. Ber. (Weinheim), 71(3):253-270, 1967. 48 refs.*

During the last 50 years more than 70 methods and apparatus for particle size analysis were developed. A method of screening using micro-sieves permits particle determinations above 5 to 10 micron. Gravity sedimentation is based on a liquid in which the particles are dispersed and allowed to settle. The speed of settling is used as a basis for determining particle size. A limiting factor of this method is the extremely long sedimentation time required for fine particles, a one-micron particle in water requires 51 hours to sink 10 cm. For such small sizes, sedimentation in centrifuges is being used; the time required for the same one-micron particle is about three minutes. The photosedimentometer derives particle determination from the weakening of light rays which penetrate the suspension. Below the one-micron particle size, rays of shorter wavelength than that of light, namely gamma X-rays must be used. A relatively simple method is to photograph a well-dispersed specimen and measure the particle images by scale. There is no lower limit to particle size since the picture can also be produced by electronic-optical photographic methods. The Coulter counter for determining particle size is based on the change of conductivity in an electrolyte that fills an opening through which the particle passes. The change is proportional to the volume of the particle. Light scattering, requiring well-dispersed particles in a liquid or a gas and suitable for sizes down to 0.1 micron, and sight instruments for interpretation of sizes of particles subjected to gravitational or centrifugal sedimentation in air are also noted. The latter method is best suited for larger particle sizes.

17514 APTIC NO. 35281

Saiyamon, G. S. and A. I. Maslyukova

DETERMINATION OF THE AMOUNT (IN MICROGRAMS) OF BORON TRIFLUORIDE AND THE PRODUCTS OF ITS HYDROLYSIS IN THE AIR. *(Opredeleniye mikrogrammovykh kolichestv Trekhftoristogo bora i produktov yego gidroliza v vozdukhe). Text in Russian. Gigiena i Sanit., no. 9:65-67, 1971. 3 refs.*

A method for the determination of boron fluoride and its hydrolysis products in air samples is presented. Microgram amounts of both categories can be determined by applying a specific reaction for fluoroborate ions which appear in water solution following absorption of an air sample containing boron fluoride. The Fluoroborate anions (BF4) produce a specific color reaction with Methylene blue in a dichlorethane solution. The method appears to be specific for BF3 and its hydrolysis products; boric acid, fluorine, chlorine, or sulfur dioxide anions produce no interference. Air samples should be drawn at low rates in serpentine-like absorbers containing water and provided with aerosol filters for capturing the BF3 hydrolysis compounds. The preparation of standard solutions required for colorimetry is described. The method had been applied successfully in an etching shop environmental air analysis. The minimum determinable amounts of BF3 were 2.0 microgram or 0.3 microgram per air sample if referred to as boron.

17515 APTIC NO. 35727

Sawicki, E., R. C. Corey, A. E. Dooley, J. L. Monkman, L. A. Ripperton, J. E. Sigsby, and L. D. White

TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD). *Health Lab. Sci., 8(4):248-250, Oct. 1971. 2 refs.*

Hydrocarbon analyzers consist of a regulated fuel and air delivery system for the hydrocarbon burner, a regulated sample injection system, electrometer for measuring the flame ion current, meter readout with connections for a recorder, and a sample pump. The sample line is attached to the inlet and the sample is pumped into a flame ionization detector. A sensitive electrometer coupled with a potentiometric recorder detects the increase in ion intensity resulting from the introduction into a hydrogen flame of an air sample containing organic compounds. The response is approximately proportional to the number of carbon atoms in the sample. Range and sensitivity, interferences, precision and accuracy, reagents, and calibration are indicated for the flame ionization method.

17516 APTIC NO. 35509

Schaedler, Walter

A METHOD OF OPERATION OF A HALOGEN DETECTION DIODE AND APPARATUS. *(Verfahren zum Betrieb einer Halogennachweisdiode und Vorrichtung zur Durchfuehrung des Verfahrens). Text in German. (Balzers Patent-und Beteiligungs-A. G. (Liechtenstein) Swiss Pat. 506,062. 3p., April 15, 1971. (Appl. June 30, 1970, 2 claims).*

A method using a halogen detection diode for the detection of leaks in large container walls is described which eliminates the shortcomings of older systems. The ionic stream flowing through the diode in the absence of halogens is subjected to great fluctuations and the diode requires detoxification when exposed to halogens by the older systems. In the improved method, the heating of the anode is dependent on the ionic stream flowing through the diode and is thus regulated by the diode to maintain a constant temperature at the anode and thus provide an ionic flow of constant magnitude. The cathode influx generated by the action of the halogen containing gas on the anode of the detection diode is a measure of the halogen effect. The device consists of a diode, a test amplifier, an indicator gauge, and a source of electricity for the heating of the anode.

17517 APTIC NO. 35424

Schneeberger, R. F. and D. P. Springston

AEROSOL SAMPLING FOR PARTICLE SIZE ANALYSIS. (FINAL COMPREHENSIVE REPORT). *Cornell Aeronautical Lab., Inc., Buffalo, N. Y., Electronics RRes½esearch Dept., Army Contract DAAA15-69-C-0337, Task 1B56260ZA0840Z, FCOMPR CAL Rept. AG-2756-E-1, 103p., Jan. 1970. 9 refs.*

NTIS, DDC: AD 867059

A rotating cup impaction sampler, developed to provide estimates of particle size and particle size distribution in aerosol clouds for particles ranging from 10 to 150 micron in size, was tested. The theoretical background of the sampler and test results of horizontal and vertical wind tunnel tests are examined. Sampling efficiencies were achieved by employing several cups of differing sizes and speeds and a range of impaction parameters. Mass median diameter and particle size distribution were then estimated by measuring the amount of aerosol material collected in each cup and comparing the collections. Limitations in the design and application

17518 APTIC NO. 35332

Schott, M. and K. R. Schmidt

CONTINUOUS MONITORING OF SULFUR TRIOXIDE (SULFOTHERM II). *(Kontinuierleiche SO3-Messung (Sulfotherm II)). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:217-224, 1970. 10 refs.*

Sulfotherm II, an instrument which continuously measures and records the sulfur trioxide content in combustion gases is described. A representative sample of the gas is drawn by an electrical membrane pump and a proportioner into the instrument. A measured amount of steam is added to the gas sample and the mix is subsequently cooled to the condensation point. The electric conductivity of the condensate is a measure of the SO3 content in the gas sample if sulfur dioxide is removed. This is accomplished in a separating column by means of superheated steam which expels the sulfur dioxide dissolved in the condensate (diluted sulfuric acid) together with traces of carbon dioxide which may be present. Since the electric conductivity is determined on a considerably diluted solution of sulfuric acid, its dependence on SO3 concentration is close to linear and thus exact enough for monitoring purposes. The steam required by the instrument is generated from deionized water and is proportioned by means of regulating valves. Reactions taking place in the Sulfotherm II apparatus are analyzed and its gauging and testing are described.

17519 APTIC NO. 35256

Schulze, Ferdinand

STATIC NITROGEN DIOXIDE MONITOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 4p., 1970. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo. June 14-18, 1970.)*

A static nitrogen dioxide monitor, based on absorption by nylon fibers and colorimetric analysis, is described. Preparation of the nylon fiber, reagents, and procedure are discussed, and some observations on the efficiency and operation are presented. The method is simple and inexpensive and appears to be quite sensitive; a positive result was obtained after a 24 hour exposure to atmosphere containing 1-2 pphm NO2. The test can also be used as a semi-quantitative procedure.

17520 APTIC NO. 35327

Shapunov, L. A., N. I. Parnyuk, T. Y. Gosteminskaya, and T. S. Kuratova

A SPECTROCHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF MICROCONTAMINANTS IN GASES. *(Spektrokhromatograficheskiy metod opredeleniya mikroprimesey v gazakh). Text in Russian. Zavodsk. Lab. (Moscow), no 9:1066-1069, 1971. 3 refs.*

A method for the determination of sulfur containing contaminants in purified coke oven gas is described. The method includes gas chromatographic separation of the components and their spectrophotometric determination. Separation of the light components is carried out in a chromosorb W - filled glass column with a 1.3 cu cm/sec Helium (carrier) rate at room temperature. Methane and ethylene are removed within 1.5 min, while hydrogen sulfide and methyl mercaptan are removed at 2.25 and 7.75 min respectively following sample imput. Separation of heavier fractions is carried out at 95 C in 1.5 M long glass columns filled with 20% silicone containing chromosorb. The relative retention times of methyl mercaptan, ethyl mercaptan, carbon disulfide, dimethyl sulfide and thiophene are 0.31, 0.73, 1.00, 1.73, and 3.2 respectively. The fractions are then passed through a discharged tube where discharge is produced by a high refquency generator. The radiation intensities are then measured by a specrometer which is tuned to the selected line of the spectrum corresponding to the element under study. Best results are obtained with 9237.49, 9228.11, and 9212.9 A lines characteristic for atomic sulfur in a Helium atmosphere. The spectrometrically recorded line intensity is proportional to the contaminant concentration contained in the gas mixture that entered the discharge tube. The surface covered by the peak of the eluted contaminant is proportional to its amount contained in the sample that was introduced into the separatory column.

17521 APTIC NO. 35751

Shigeta, Yoshihiro

METHODS OF MEASURING BAD ODOR AND CONTROL TECHNIQUE. *(Akushu no sokutei-ho to boshi gijutsu). Text in Japanese. Japan Society of Efficiency, Tokyo, Chem. Plant Eng. Conf. Proc., Tokyo, Japan, 1971, p. 2-2-1 - 2-2-10. (Oct.)*

Various methods used for odor sensitivity tests are examined and discussed. In general, results from the injection method were lower than those from the odorless chamber method; indices from the Shuken Kinoshita (saline-water equilibrium) method were approximately 1/100 lower than the injection method, due to the fact that many odor causing elements do not dissolve easily in water. The scentometer was also discussed. Methods of mechanical analyses included gas chromatography; the low-temperature adsorption method; the vacuum jar method; and the solid reaction tube method, using appropriate reagents for different odors.

17522 APTIC NO. 35083

Sivasankara Pillay, K. K½, Charles C. Thomas, Jr., James A. Sondel, and Carolyn M. Hyche

DETERMINATION OF MERCURY IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES BY NEUTRON ACTIVATION ANALYSIS. *Anal. Chem., 43(11):1419-1425, Sept. 1971. 17 refs. (Presented at the American Chemical Society National Meeting, 161st, Los Angeles, Calif., March 1971.)*

A neutron activation analysis procedure for the determination of trace levels of mercury was tested on a set of fish homogenates, human brain tissues, plankton/algae, and sediment/silt samples. Problems of mercury losses throughout sampling and analysis were examined. After neutron activation, the samples were wet ashed with mercury carrier. A preliminary precipitation was followed by purification; electrodeposition or precipitation were used to isolate mercury for determination by scintillation spectrometry. The procedure could also be used for the determination of mercury in coal samples, air particulates, and food material. (Author abstract modified)

17523 APTIC NO. 35918

Spliethoff, Heinz

TAKEOFF FOR HOT DUSTY GASES. *(Assignee not given.) U. S. Pat. 3,592,562. 4p., July 13, 1971. 4 refs. (Appl. Nov. 12, 1969, 5 claims).*

Devices for taking off hot dust-laden flue gas are generally beset with unfavorable operation. The high temperatures and corrosive flue gases combine to cause strain on the construction material. Small particles can become deposited and clog the device. In order to extend the life of the takeoff device, wash water can be applied. An apparatus for the removal of hot dusty gases from furnaces, using injector action to aspirate dirty furnace gas from a sample zone and force it to a gas analyzer, is examined. Part of the water used for injector action is used to scavenge and rinse the walls of the gas takeoff passageway, with the centrifugal force of water rotation holding the major cross sectional area of the passageway open. The washing stream is biased to move counter to gas aspiration and leaves the device as a conical water curtain opening toward the furnace. (Author abstract modified)

17524 APTIC NO. 35191

Stevens, Robert K., Lewis F. Ballard, and Clifford E. Decker

FIELD EVALUATION OF SULFUR DIOXIDE MONITORING INSTRUMENTS. *Preprint, Environmental Protection Agency, Raleigh, N. C., Air Pollution Control Office, and Research Triangle Inst., Research Triangle Park, N. C., 12p., 1971. 5 refs.*

As part of a comprehensive evaluation program designed to compare newly developed air pollution monitoring systems with classic procedures for measuring ambient concentrations of sulfur dioxide, the following S02 monitoring principles were compared: colorimetric (West-Gaeke), conductometric, coulometric, flame photometric, and combined gas chromatographic-flame photometric. The evaluation was performed in Los Angeles, California over an 83 day period between September and December 1970. Results showed that the flame photometric detector (FPD) and gas chromatographic-FPD instruments required the least maintenance and were operational for more that 93% of the evaluation period. Coulometric and conductometric S02 measurements were consistently higher than values obtained by flame photometric methods. Hydrogen sulfide and methyl mercaptan were occasionally present in the Los Angeles atmosphere. Sulfur dioxide frequently exceeded 0.030 ppm during the afternoon and total gaseous sulfur in Los Angeles was better than 90% S02. (Author summary modified)

17525 APTIC NO. 35825

Terrill, J. G., Jr.

LIMITATIONS AND NEEDS FOR NUCLEAR TECHNIQUES IN ENVIRONMENTAL CONTROL. *International Atomic Engergy Agency, Vienna (Austria), Nucl. Tech. Environ. Pollut., Proc. Symp., Salzburg (Austria), 1970, p. 81-89. 8 refs.*

Views on the application of nuclear techniques in the environmental field have been under study since radioisotopes became available; they were intensified by the advent of activation analysis and the fallout from weapons testing which provided data for many scientific fields but particularly for meteorology and ecology. The viewpoint of the Federal Radiation Council is to require a risk/benefit evaluation for the inauguration of large-scale uses of radioisotopes discharged into the environment. The present thinking has not only been influenced by the students of radioactivity, but also by threats to the environment by substances that have been considered to be safe, such as pesticides and mercury. Persistence plus diversification of ecological patterns have led to legislative, regulative, and judicial action to eliminate environmental discharges of material with carcinogenic, teratogenic, and mutagenic associations. The need to eliminate these substances decreases the flexibility of use of radioisotopes but it also presents opportunities for their use. The nature of the mercury problem and contamination of water and fish is discussed, including the extent to which activation analysis techniques can be utilized. Physical and laboratory parameters, field applications, and the integration of the data into a meaningful evaluation of the risk are reviewed. (Author abstract modified)

17526 APTIC NO. 35984

Tokiwa, Y. and P. K. Mueller

STATUS OF MEASURING AIR QUALITY. *J. Environ. Sci., 14(6): 10-19, Nov./Dec. 1971. 22 refs.*

To assess air quality and to determine compliance with legally established air quality standards, carbon monoxide, total oxidants, nitrogen dioxide, nitric oxide, sulfur dioxide, hydrogen sulfide, hydrocarbons, and suspended particles are measured extensively. Methods currently in use are described in order to present some perspectives about the state of the art, limitations of these methods, suggestions concerning improved air monitoring devices, and the direction of efforts needed to improve methods in the near future. In general, the methods to monitor gaseous pollutants have been based on reactions in aqueous solutions followed by colorimetric or electrochemical sensing; broad band infrared absorption directly in the gas phase; and flame ionization in the gas phase with or without prior gas chromatographic separation. Changes in design of the new instruments are indicated. California ambient air quality standards and the most frequently monitored substances are presented tabularly. (Author introduction modified)

17527 APTIC NO. 36002

Torii, Kenji

AUTOMATED CHEMICAL ANALYSIS OF AIR AND WATER POLLUTION. *Preprint, Dept. of Commerce, Washington D. C., and Water Pollution Control Federation, Washington, D. C., 13p., 1971. (Presented at the Technical Conference on New Technology in the Solution of Practical Problems in Air and Water Pollution Control, Tokyo, Japan, Dec. 9, 1971.)*

The contribution of automated pollution analysis of impinged samples, continuous single channel systems, and comprehensive mobile laboratories to the study of man s environment is discussed. A typical flow diagram for fluoride in waste water illustrates the use of basic automatic analyzer modules. Water quality assessment and the monitoring of organic wastes in waste water are discussed, as well as the periodic or cumulative sampling of air quality. Recent technical developments in instrumentation and application are presented. However, automated analysis in itself cannot make any contribution to the study of the environment we live in, without the proper personnel utilizing the techniques that are available, and producing meaningful interpretation of the vast amount of data so obtained. (Author conclusions modified)

17528 APTIC NO. 35598

Turk, Amos, Henry Sleik, and Philip J. Messer

DETERMINATION OF GASEOUS AIR POLLUTION BY CARBON ADSORPTION. *Am. Ind. Hyg. Assoc. Quart., 13(1):23-28, March 1952. 10 refs. (Presented at the American Chemical Society, 119th Meeting, Boston, Mass., April 3, 1951.)*

The use of activated carbon for the determination of gaseous impurities by adsorption is described. The apparatus includes two canisters arranged in series and for like conditions of air flow through the carbon beds. This arrangement can be used to measure the adsorption efficiency of the canisters for typical organic vapors. While activated carbon has no retentivity for water vapor and the presence of water vapor in no way affects its collecting effectiveness, it is, however, necessary to discount for the water vapor present in the carbon to arrive at a true quantitative determination for non-aqueous impurities. Since the collection unit is so designed that a uniform rate of air flow and identical duration of contact between air and carbon are assured, the distribution of sorbed impurities in the carbon will likewise be uniform. This enables the carbon to be divided into several convenient samples for distinct parallel determinations. Thus, one sample may be used to desorb the non-aqueous organic substances, while another is used to establish moisture content.

17529 APTIC NO. 35571

White, E. W., H. Goerz, G. G. Johnson, Jr., and R. E. McMillan

PARTICLE SIZE DISTRIBUTIONS OF PARTICULATE ALUMINAS FROM COMPUTER-PROCESSED SEM IMAGES. *Scanning Electron Microsc., vol. 3:57-64, 1970. 6 refs. (Presented at the IIT Research Institute, Scanning Electron Microscope Symposium, Annual, 3rd, Chicago, Ill., April 1970.)*

The basic approaches to computer processing of scanning electron microscope images were used to quantitatively determine the particle size distribution of several fine-grained aluminas of commercial and research interest. Specimens were prepared by aspirating droplets of suspension onto aluminized glass slides. Experimental procedures are described. Criteria for magnification settings were determined with respect to particle shape and minimum particle size. Particle size distribution curves are presented and deviations from log-normal behavior are discussed. (Author abstract modified)

17530 APTIC NO. 35306

Wilks, Paul A., Jr.

INFRARED ANALYSIS OF PROCESS EMISSIONS. *Chem. Eng., 78(28):120, 122, 124, Dec. 13, 1971.*

The trend in instrumentation for pollution monitoring is toward low-cost, reliable instruments for continuous on-the-spot monitoring and analysis of a broad range of pollutants. Wet-chemical methods, bubbler devices, colorimetric techniques, conductometric methods, gas chromatography, and nondispersive infrared analysis are mentioned. Until quite recently, dispersive infrared instruments -- those that can be tuned to various infrared frequencies as opposed to nondispersive or fixed-frequency instruments -- were complicated, suitable only for research applications. However, new developments have allowed the construction of rugged, portable infrared instruments that cost a few thousand dollars yet have the quantitative accuracies of more expensive, larger research-grade instruments. One approach to the design of portable infrared instruments replaces the complicated optics usually used to vary the infrared frequency with a circular, variable filter, which cuts down the optical path from two to three m in conventional instruments to eight cm. Small instruments and sample cells are discussed, as well as stack gas monitoring, plant-stream analysis, and vapor monitoring in enclosed areas.

17531 APTIC NO. 35173

Williams, Charles R. and Leslie Silverman

COLLECTION OF FLUORIDE FUMES IN AIR. *J. Ind. Hyg. Toxicol., 27(4):115-117, April 1945. 3 refs.*

Fluoride fumes occurring in magnesium casting are largely particulate and not gaseous hydrogen fluoride. The efficiency of filter papers for collection of the fumes was determined in the laboratory using the method in which a filter holder is followed by an AC electrostatic precipitator. Efficiency of Whatman No. 44 was nearly 100% at 28.3 and 55.6 liters/min. Haton and Dikeman No. 613-21 also gave very high results. In each case, efficiency was proportional to paper air-flow resistance. Comparable efficiencies were obtained in field studies for comparison of the filter paper method with an electrostatic precipitator.

17532 APTIC NO. 35317

Wohllebe, H.

MEASURING DEVICES FOR EXHAUST EMISSIONS BY DIESEL ENGINES. *Deut. Agrartech., 1971: 425-428, Sept. 1971. 8 refs. Translated from German in: Translations on Eastern Europe - Economic and Industrial Affairs, no. 573:16-24, Dec. 2, 1971, Joint Publications Research Service, Washington, D. C.*

NTIS: JPRS 54598

East German restrictions on diesel smoke density are discussed together with smoke density test methods and smoke density meters. Smoke density measurements are intended to determine the maximum soot content of diesel exhaust. Therefore, measurements are made at full-load (maximum injection) operation by braking the engine on a test stand or acceleration of the vehicle on a roller stand. Smoke density meters based on the light transmission principle are preferred to those based on the filtration principle for tests carried out by the acceleration method. If smoke density exceeds permissible values, special tests must be made to determine engine adjustments or repairs needed. Tractors and farm trucks are to be tested with meters operating on the light transmission technique. Objectives of the program are improved air quality and improved traffic safety.

17533 APTIC NO. 35100

Yamanaka, Chiyoe

AIR POLLUTION SURVEY BY MEANS OF LASER RADAR. *(Reza reda ni yoru taikiosen kansoku). Text in Japanese. Osaka Univ., Faculty of Engineering, 126p., March 1969. 28 refs.*

In order to forecast air pollution, laser radar and a laser echo can be used. The following observations were made: the measurement of the distance to the clouds; the recording of the laser echo from a thin aerosol which is invisible in the atmosphere; the recording of laser echo from the smog layer. The changes of smog were observed by day, also the changes of smog at midnight through daybreak were observed. The changes of the invisible thin aerosol could be sharply detected. There was no definite relationship between the altitude of the atmospheric temperature inversion zone and that of the zone where specific laser echo can be obtained. The efficiency of the apparatus will be improved. The possibility of the establishment of the smog forecasting system by comparing the data of the observation of smog phenomena and the experiments using laser radar carried out throughout the year was also suggested.

17534 APTIC NO. 35766

Yoshino, Masanori

A SLIDE RULE FOR STACK GAS DISPERSION PATTERN CALCULATION. *(Entotsu yori no taiki kakusan keisanyo keisanjaku). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 7(11):679-682, Nov. 1971.*

A slide rule for calculation of sulfur dioxide ground concentration is introduced. The structure is similar to that of an ordinary slide rule. Before the ground concentration can be calculated, the following five figures must be obtained: the stack height, the quantity of emission, the quantity of sulfur dioxide emission, the emission temperature, and velocity. However, if the ground concentration is known, one of the above elements may be calculated. From the slide rule and the formulas introduced, the following figures may also be calculated: the maximum concentration ppm on the ground; the distance above the ground to the maximum concentration in kilometer; the ground concentration at various spots in the lee, in ppm; and the stack height, calculated from the maximum concentration on the ground.

AIR QUALITY MEASUREMENTS

17535 APTIC NO. 35152

Ibaragi Prefecture (Japan), Public Nuisance Technical Center

ANNUAL REPORT OF PUBLIC NUISANCE TECHNICAL CENTER, IBARAGI PREFECTURE (1969). *(Ibaragiken kogai gijutsu senta nenpo)Showa 44 nendo)). Text in Japanese. 85p., Feb. 1970.*

The history of the development of the Ibaragi Prefectural Pollution Control Technical Center, its commission projects, personnel, work responsibilities, and monitoring equipment are discussed. Research activities, meeting attendance, and pollution control technical conference participations are reviewed. In 1969, in addition to already existing monitoring locations, one more in monitoring spot the Hitachi Area and five more in the Kashima area were installed, in order to understand the air pollution situation in both areas, which are designated control areas. Settling particles and sulfur oxides are continuously monitored by deposit gauges and the lead dioxide method, respectively. In both areas, no particular changes have been noted between 1968 and 1969. In the Kashima area, meteorological observations have been conducted since 1969in order to obtain basic material for the air pollution investigation. Wind directions, wind velocities, temperature, high strata temperature, and humidity are monitored at eight locations. Flue gases are monitored at plant sites. Dust and sulfur oxides are measured, and appropriate advice and guidance are given. Complaints and appeals made in these areas are investigated, and appropriate treatments are promoted. Results are given for these various measurements during 1969.

17536 APTIC NO. 35403

STATEWIDE EMISSION INVENTORY OF VERMONT. *TRC, The Research Corp. of New England, Hartford, Conn., Environmental Protection Agency Contract 68-02-0047, Rept. 4283, Task 2, 52p., Sept. 1971. 1 ref.*

NTIS: PB 203503

The approach and the results of the work performed for the State-wide Emission Inventory for Vermont are documented. The Objective of the project was to support the State of Vermont Industrial Hygiene Division in the Collection, processing, and reporting of emission source data for five air-pollutants--sulfur dioxide, particulates, nitrogen oxides, hydrocarbons, and carbon monoxide emissions. The work began after Vermont had initiated mailings of questionnaires to commercial and industrial establishments. Additional mailings to hospitals, fuel dealers, and of the source emissions schools were prepared and delivered to Vermont. Grids maps are included. Fuels included natural gas, coal, fuel oil, and wood. Emission sources included gasoline evaporation, incineration, diesels, trains, automobiles, open burning and solvent evaporation.

17537 APTIC NO. 35405

STATEWIDE INVENTORY OF AIR POLLUTANT EMISSIONS STATE OF KANSAS 1970. *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, 63p., Aug. 31, 1971. 5 refs.*

NTIS: PB 203350

The emissions of air pollutants have been calculated from point and area sources in Kansas, and the emission data have been assembled in a suitable format for use in developing an implementation plan. Particulates, sulfur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons were included in the emissions inventory. Area grids are included. Sources included fuel combustion (coal, residual oil, natural gas, distillate oil), electric power generation, flour mills, chemical industries, grain mills, refining, steel and rubber manufacturers motor vehicles (gas and diesel), aircraft, trains, open burning, and solvents.

17538 APTIC NO. 35430

FINAL REPORT. 1969 ATMOSPHERIC REACTION STUDIES IN THE LOS ANGELES BASIN. VOLUME IV. AIRBORNE DATA. ESSA COOPERATIVE DATA. *Scott Research Labs., Inc., Plumsteadville, Pa., National Air Pollution Control Administration Contract 70-6, APRAC Proj. CAPA 7-68, Scott Proj. 1142, 304p., Feb. 16, 1970.*

NTIS: PB 194064

Data is presented for chemical and meteorological parameters measured aloft during 26 aircraft flights above Los Angeles, as well as for analyses performed on the Tedlar bag samples collected during vertical profiles. Parameters determined include altitude, time of day, dry-bulb and wet-bulb temperatures, relative humidity, dew point, incoming and outgoing ultraviolet radiation, total oxidant, nitric oxide, nitrogen dioxide, and carbon monoxide concentrations.

17539 APTIC NO. 35764

PUBLIC NUISANCE WHITE PAPER, 1971. *(Kogai hakusho, Showa 46 nendo ban). Text in Japanese. 483p., July 10, 1971.*

The state of air pollution in Japan is surveyed with respect to statistical data on concentrations of sulfur oxides, carbon monoxide, nitrogen oxides, suspended and settling particulates, and specific toxic materials (hydrogen fluorides and hydrogen cyanides). Local conditions are discussed with emphasis on areas with complex and acute air pollution problems, such as the Tokyo-Yokohama and Osaka-Amagasaki areas; specific industrial developments, e.g., Fuji, South Nagoya, Yokkaichi, North Kyushu, and Omuta; and areas where pollution is rapidly increasing due to the development of large-scale industrial complexes, such as Tomakomai, Kashima, Chiba-Ichihara-Kimizu, Mizushima, and Oita. Damages caused by air pollution and effects on human health and agricultural and forestry produce are discussed. Governmental means of control, the nation-wide network of pollutant measuring devices, and local and regional surveillance systems are reviewed. The policy on desulfurization and acquistion of low-sulfur fuels is outlined. Indirect control measures included a buffer-green area development plan, large-scale heating-cooling systems instead of individual home or building systems, and construction of collective high stacks. The offensive odor control bill is summarized.

17540 APTIC NO. 35682

Aitken, John

ON SOME OBSERVATIONS MADE WITHOUT A DUST COUNTER ON THE HAZING EFFECT OF ATMOSPHERIC DUST. *In: Collected Scientific Papers of John Aitken, LL.D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press, 1923, Chapt. 21, p. 284-293.*

Without counting the number of dust particles, it is shown that the transparency of the atmosphere is very much destroyed by the impurities communicated to it while passing over the inhabited areas of the country. If on two days the humidity was the same, but on one day the haze was thicker than the other, then it may be concluded that the greater thickness was due to a greater amount of dust in the air. Tables were accordingly prepared, in one of which all the observations made when the wet bulb depression was 2 deg were entered, while in other tables were entered the observations when the depressions were respectively 3, 4, 5, 6, 7, and 8 deg and over. The different observations in each table were at the same time entered in such a manner that all those made when the wind was north were together, all those when it was northeast next each other, and so on. Thus in each of the seven tables for the different degrees of wet bulb depression were entered the direction of the wind, and the limit of visibility on different occasions, all those for each direction of wind being next each other. Falkirk

(Scotland) is so situated that the winds from the west, northwest, and north come to it but little polluted, whilst from all other directions they come polluted by passage over more or less densely populated districts. The clearness of the air is inversely proportional to its relative humidity.

17541 APTIC NO. 35051

Bosch, John C., Michael J. Pilat, and Bjorn F. Hrutfiord

SIZE DISTRIBUTION OF AEROSOLS FROM A KRAFT MILL RECOVERY FURNACE. *Tappi, 54(11):1871-1875, Nov. 1971. 11 refs.*

The size distribution of particulates emitted from a kraft mill recovery furnace was measured using a source test cascade impactor designed for isokinetic sampling directly inside the stack. The distributions were calculated from the weight of solids deposited on each impactor stage. Particle mass median diameter was one micron at the electrostatic precipitator inlet and 1.4 micron at the outlet. Sodium chloride concentration was higher in the submicron particles at the electrostatic precipitator outlet but independent of size at the inlet. (Author abstract modified)

17542 APTIC NO. 35422

Bouquiaux, J. and J. Grandjean

AIR POLLUTION BY SMOKE AND SO_2. *(Pollution atmospherique. Fumee et SO_2). Text in French. Bull Mens. Inst. Royal Meteorol. Belgique, 28p., April 1970.*

The monthly bulletin of atmospheric pollution indexes for April 1970 compiled by the Belgian air pollution recording network contains tables of sulfur dioxide and particulate levels in micrograms per cu m air recorded by 230 measurement stations. One hundred of these stations are located in the five industrial centers of Brussels (25), Antwerp (25), Liege (20), Charleroi (15), and Gand (15), 100 are located in smaller cities in selected regions of Belgium, and 30 are meteorological stations equipped with anemometers. Data are processed by the Computing Center of the Royal Meteorological Institute. The sampling apparatus developed by the Institute of Hygiene and Epidemiology and the Royal Meteorological Institute consists of an electric membrane pump aspirating approximately 2 cu m air per day through a Whatman No. 1 paper filter, a wash bottle containing 50 ml 0.3% H_2O_2 solution, and a gas meter. The device contains 8 filter-wash bottle sets, each of which automatically replaces the preceding set at 9:00 each morning; these sets are collected once a week. The filters are analyzed reflectometrically for average daily dust fall levels; the wash bottle contents are titrated acidimetrically for average daily SO_2 levels. The city of Brussels in April had a mean daily dust fall of 41 micrograms and a mean daily SO_2 level of 163 micrograms (maximum 1513, minimum 12).

17543 APTIC NO. 35227

Burt, W. T. III and Bruce J. Gueho

AIR POLLUTION FROM HOT MIX PLANTS. *Louisiana State Dept. of Highways, Research and Development Section, Dept. of Transportation, Federal Highway Administration Research Rept. 50, Project 68--1Ch(B), Louisiana HPR 1(8), 41p., Oct. 1970. 15 refs.*

NTIS: PB 199355

The emission of particulates from processes in the hot mix industry was investigated. High-volume air samplers and dust collection buckets were used to collect emissions and the results were correlated with data from a mechanical weather station to determine the effect of wind direction, speed, turbulence, temperature, and plume behavior on the emissions. Maximum and minimum daily concentrations were 1000 and 175 micrograms/cu m. Emissions from plant driers and secondary sources accounted for half of the pollution. Operation modification and more effective stack heights, along with cyclones, scrubbers, and bag dust collectors, were recommended as controls.

17544 APTIC NO. 35501

Commins, B. T., F. J. Raveney, and M. W. Jesson

TOXIC GASES IN TOWER SILOS. *Ann. Occupational Hyg., vol. 14:275-283, 1971. 14 refs.*

Diurnal variations of carbon dioxide, nitric oxide, and nitrogen dioxide concentration were measured in a tower silo during the preparation of silage for winter feeding of animals. The varying concentrations of the gases emitted by the decomposing grasses were determined by standard colorimetric procedures and Orsat analysis. Five measurements of carbon monoxide concentrations determined the maximum at 100 ppm. The concentrations of the nitrogen oxides reached a peak on the fifth day after loading; the highest concentration of carbon dioxide was 78%. Correlatory data on gas temperature and the effects of covers and ventilation on the concentrations were investigated. The highest concentrations of gases were at the lowest levels in the silos. Safe levels of exposure and protective measures to prevent toxic occupational hazards were discussed.

17545 APTIC NO. 35392

Crebbs, Thomas C., Michael A. Fradel, Edward E. Garrett, George W. Gauger, Wilfried H. Portig, and Jackie L. Smith

ENVIRONMENTAL DATA BASE FOR REGIONAL STUDIES IN THE HUMID TROPICS. (FINAL REPORT). *Army Tropic Test Center, Fort Clayton, Canal Zone, Advanced Research Projects Agency Order 740, Proj. USATECOM-9-CO-059-000-001, Proj. OCRD-2MO25001A724-01 Rept. ATTC-7008004, 93p., Aug. 1970. 19 refs.*

NTIS, DDC: AD 723060

Spatial and temporal variations of militarily significant elements of the humid tropical environment were investigated. Data were collected on climate, soils, hydrology, vegetation, microbiology, chemistry of the atmosphere, and the macrofauna; and computer storage and retrieval were arranged for. Two main sites, one in a forest and one in a near-by open area, were established on the Pacific side of the Canal Zone to observe a broad range of environmental elements synchronously over relatively long time periods; satellite sites were also established. Atmospheric measurements included distribution of airborne microorganisms, microorganisms as sources of atmospheric contaminants, and sampling of condensation nuclei, large (greater than 40 micron) particles, carbon dioxide concentration, and levels of spores, plant and insect parts, and chemical crystals. Data storage format and repository locations are reported.

17546 APTIC NO. 35155

Funke, G. and H. A. Fischer

RESULTS OF DUST MEASUREMENTS IN CEMENT FURNACES. *(Resuldados de las mediciones de polvo en hornos de cemento). Text in Spanish. Mater. Constr. (Madrid), no. 135:25-35, 1969.*

A total of 270 measurements of the dust levels in the exhaust fumes of 79 furnaces at 39 cement plants were carried out during 1966 in Germany, in order to ascertain whether they comply with the existing requirements of air purity. In the great majority of the cases, the dust levels were well within the current maximum allowable limits. In humid process rotary furnaces with electrostatic filters, the concentration of dust in the exhaust varied from 0.090 to 0.226 g/cu m; in similar installations provided with driers and electrostatic filters, the dust levels varied from 0.047-0.140 g/cu m. In Lepol furnaces with electrostatic filters, the dust levels in the exhaust were 0.031-0.150 g/cu m. In rotary furnaces with gaseous suspension preheaters directly connected to electrostatic filters and water spraying, the dust levels varied from 0.033 to 0.350 g/cu m. In such installations the gas conditioning process is particularly difficult. Dust levels of 2.33-9.98 g/cu m were found in the air which escapes from the furnace grating.

17547 APTIC NO. 35761

Georgievsky, Yu. S. and R. Kh. Khalikova

ON DAILY AND SEASONAL VARIATIONS OF CO2 CONTENT IN THE NEAR GROUND LAYER OF THE ATMOSPHERE.

(O sezonnykh i sutochnykh variatsivakh soderzhaniya CO2 v prizemnom sloye atmosphery). Text in Russian. Akad. Nauk SSR, Fiz. Atmosfery i Okeana, 7(9):991-995, Sept. 1971. 15 refs.

A qualitative image of seasonal and diurnal variations in the carbon dioxide content of the ground level atmosphere was obtained by spectral absorption measurements (around the two micron region) carried out between November 1967 and November 1968. Daily measurements were made 2.0 or 2.5 m above the ground during the first half of the day when temperature, humidity and other features of the environmental conditions were recorded. The CO2 cycle in the atmosphere was considered to reflect both physiological (assimilation and respiration) processes occurring within the plant system and vertical and horizontal air mining processes. High peaks in CO2 concentrations (20% above the average) were observed during the month of May. These night peaks were due to excretory plant processes, as opposed to the daily enhanced CO2 absorption processes related to photosynthesis. A seasonal peak in CO2 concentration was observed at the end of January (80-90% increase) and was due to the general decrease in CO2 absorption capacity of the forests. Higher CO2 concentrations were significantly correlated with lower atmospheric temperature conditions.

17548 APTIC NO. 35658

Godzik, Stefan and Jan Greszta

ESTIMATION OF AIR POLLUTION IN FORESTS OF CENTRAL PART OF KATOWICE DISTRICT AND THE WESTERN PART OF KRAKOW DISTRICT.

Polish Acad. of Sciences, Zabrze, Research Inst. of Upper Silesian Industrial Region, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na lasy, 6th, Katowice, Poland, 1968, p. 235-248. 10 refs. (Sept. 9-14.)

Sampling stations were established at twenty-two locations in Katowice and Krakow, Poland, to determine the amount of air pollution in forests at varying distances from industrial centers. Sulfur compounds were measured by the lead peroxide method, dustfall by sedimentation with Weck jars, and sulfates in water collected in sedimentation jars by turbidimetry; 2 ph values were also determined. High concentrations of sulfur compounds were found in the highly industrial areas, with seasonal influences noted. Dustfall levels, however, were relatively low even in highly polluted areas. PH values were in most cases acidic.

17549 APTIC NO. 35489

Harrison, Paul R., Wayne R. Matson, and John W. Winchester

TIME VARIATIONS OF LEAD, COPPER AND CADMIUM CONCENTRATIONS IN AEROSOLS IN ANN ARBOR, MICHIGAN.

Atmos. Environ. (London), 5(8):613-619, Aug. 1971. 7 refs.

Air samples in Ann Arbor, Michigan, were analyzed by anodic stripping voltammetry (ASV) with a composite graphite electrode for the average mass distribution with particle size of lead, copper, and cadmium. The samples were collected with a modified seven-stage Andersen cascade impactor with a glass backup fieter at two-hour intervals over a 42-hr period from April 26-28, 1969. Average particle size distributions were similar for the three elements over the radius range covered by the impactor stages which sort particles into factor of two radius intervals (0.1 less than or equal to r less than or equal to 10 micron). Lead, however, showed a significantly greater proportion of its total concentration in particles caught by the filter (radius less than or equal to 0.1 micron) than did Cu or Cd. Variations of each of the elements of over a factor of 10 were seen within any 24-hr period during the 42 hours. Two prominent maxima were observed at 0200-2400 EST, suggesting a wind shift from north to east. The results imply that some of the Cu and CD, and much of the Pb, at the maximum times, came from the Detroit sector by easterly winds and that a two-hour sampling program is adequate for correlating changes in the environment with mesoscale meteorological parameters. (Author abstract modified)

17550 APTIC NO. 36009

Hasegawa, Toshio and Akiyoshi Sugimae

TRACE METALS IN AIR BORNE PARTICULATES. I. SURVEY OF LEAD IN THE ATMOSPHERE.

(Fuyu funjin-chu no kinzoku seibun (daiippo) namari ni yoru kankyo osen). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 17(6):404-411, Dec. 1971. 12 refs.

The concentration of lead in the atmosphere was measured at 12 sampling sites in Osaka (commercial, residential industrial, and rural) every day in June (1969), October (1969), and February (1970). Lead in samples collected by High Volume Air Sampler, Cascade Centripeter, and Tape Air Sampler was determined by emission spectrographic analysis. The monthly average concentration at various locations ranged from 0.11 to 4.44 micrograms/cu m, with an overall average of 2.03 micrograms/cu m. Distribution of lead content in airborne particulates formed a distribution of approximately logarithmic normal type. Its mean value was 0.63% and the upper limit was 1.9% at the one-side significant level of 5.0%. Size distribution of lead particulates in the atmosphere was also investigated; the distribution curves at every sampling site were almost alike and 81-98% of the lead particulates were less than one micron in diameter. An inverse correlation was found between lead concentration in the atmosphere and wind velocity. The slope of the regression line, representing the ratio of lead concentration to wind velocity was greater in heavy traffic area than in a residential area. Diurnal variation of lead concentration, determined continuously every hour by the Tape Air Sampler, was also inversely correlated with wind velocity. In addition, correlation between lead and carbon monoxide concentration in the atmosphere was also studied. 0

17551 APTIC NO. 35098

Himi, Yasuji

AIR POLLUTION IN INDUSTRIAL CITIES.

(Kogyo toshi no taiki osen no jittai). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 50(534:756-767, Oct. 1971. 10 refs.

The compositions of gases from coal combustion, electric power plants, and automobile exhaust are reviewed. The 1968 statistics of the main pollutants in the United States and their main sources and comparisons of air pollution types in London and Los Angeles are given. According to Japanese data, the amount of settling particles generally dropped between 1959 and 1966, but rose again slightly in 1967. The 1965 statistics showed the highest average settling particles of 27.92 t/sq km/month in Tokyo, followed by 24.87 in Omuta. The highest single record in 1965 was 135.26 t/sq km/month in Kamaishi, which averaged 22.81 for the entire year. Kawasaki had 123 t/sq km/month as the highest single record, and 22 as the monthly average. A breakdown of settling particles shows components such as silicon dioxide, ferric oxide, aluminum oxide, calcium oxide, manganese oxide, sulfate, and chlorine. Variations between the cold and hot seasons, and industrial and non-industrial areas are reviewed. In general, Si02 and sulfate occupy a large part of the particulates in any area, but the ratios vary a great deal. Industrial areas show iron, manganese, SO4, tin and chromium content than non-industrial areas, in cold season, nickel and vanadium seem to increase in non-industrial areas. The amount of lead content is evenly distributed. There is a definite correlation between the rainfall quantity, the sulfur dioxide concentration in the air, and the amount of SO4 in particles. The SO2 in the air seems to be absorbed by settling particulates. High degrees of correlations are manifest between Ca and SO4, Fe and Mn, Fe and Ti, and V and Ni.

17552 APTIC NO. 36024

Himi, Yasuji

AIR POLLUTION IN INDUSTRIAL CITIES. *(Kogyo toshi no taiki osen no jittai). Text in Japanese. Nenryo Kyokaishi (J. Japan Fuel Soc. Japan, Tokyo), 50(534):756-767, Oct. 1971. 10 refs.*

Air pollution in industrial areas has become a problem in recent years. Sources, chemical compositions, and distributions of pollutants are reviewed. Pollutants include carbon dioxide, carbon monoxide, sulfur dioxide, sulfur trioxide, nitrogen oxides, metals, metal oxides, particulates, and sulfates. Data is given for air pollutants in Japan and various cities in the U. S.

17553 APTIC NO. 35725

Jernigan, Eva L., Barbara J. Ray, and Robert A. Duce

LEAD AND BROMINE IN ATMOSPHERIC PARTICULATE MATTER ON OAHU, HAWAII. *Atmos. Environ., 5(10):881-886, Oct. 1971. 20 refs.*

Atmospheric particulate lead and bromine concentrations were determined for samples collected in and around urban Honolulu, Hawaii. The samples were collected during periods of tradewind weather which should cause a maximum dispersion of pollutants. The average urban curbside concentrations of lead and bromine were 7.7 micrograms/cu m and 1.60 micrograms/cu m respectively, similar to or higher than concentrations reported for mainland cities. The coefficient of correlation between the bromine and lead concentrations was 0.97, suggesting a common source for both pollutants. Although the most probable source is automobiles, the Br/Pb ratio for urban curbside samples was 0.22 plus or minus 0.04, lower than the ethyl fluid ratio of 0.39. This may indicate that bromine is lost from the particles after emission to the atmosphere. The consistency of the ratio, compared to previous studies, is probably a result of the persistent meteorological conditions during tradewind periods. (Author abstract)

17554 APTIC NO. 35545

Junge, C. and G. Scheich

DETERMINATION OF THE ACID CONTENT OF AEROSOL PARTICLES. *(Studien zur Bestimmung des saeuregehaltes von Aerosolteilchen). Text in German. Atmos. Environ., 3(4):423-441, July 1969. 19 refs.*

The hydrogen ion concentration of aerosol samples dissolved in neutral water were determined by titration and also by measuring the pH-value. Simultaneous with these data, the concentration of sulfate and of soluble matter in aerosols, of sulfur dioxide, and of some other chemical constituents of the atmosphere, which may influence the formation of hydrogen ions in aerosols, were measured. Measurements were made in London, Goeteberg, Gelsenkirchen, and Mainz. The titration method gave considerably higher hydrogen ion concentrations than the pH-method, which indicates that the hydrogen ion concentration of aerosol particles is either due to weak acids or to strong acids which are buffered by weak bases. Most of the water soluble compounds of the aerosols and particularly the hydrogen ion content is associated with particles smaller than 0.1 micron radius, in contrast to the total aerosol matter which is primarily associated with particles larger than 0.1 micron radius. The various locations showed differences in the hydrogen ion content with highest values in London. Correlations of the hydrogen ion concentration with the content of water soluble matter and of sulfate in aerosols or with the sulfur dioxide concentration were weak or nonexisting, indicating that processes of acid formation on aerosols and its neutralization are rather complex. (Author abstract modified)

17555 APTIC NO. 35715

Just, Jan and Jadwiga Kelus

CADMIUM IN ATMOSPHERIC AIR OF 10 SELECTED TOWNS IN POLAND. *(Kadm w powietrzu atmosferycznym 10 wybranych miast w Polsce). Text in Polish. Roczniki Panstwowego Zakladu Higi., 22(3):249 256, 1971. 18 refs.*

The first attempt to determine the content of cadmium in the dust suspended in atmospheric air in Poland is discussed. The tests showed a relatively low cadmium concentration (ranging from 0.002% to 0.018%) and little variation during the year. Only in Katowice was the concentration of cadmium (0.051 microgram/cu m) close to that found in Chicago, a city with the highest level recorded in the United States. Lowest concentrations occurred in Gdansk (0.002 microgram/cu m). These findings show no immediate health hazard.

17556 APTIC NO. 35407

Kennedy, William R., William D. Purtymun, and Harry F. Schulte

LOS ALAMOS ENVIRONMENTAL MONITORING PROGRAM. JULY THROUGH DECEMBER 1970. *California Univ., Los Alamos Scientific Lab., N. Mex., Atomic Energy Commission Contract W-7405-eng 36, Rept. UC-41, 9p., July 1971. 7 refs.*

NTIS: LA-4672-MS

The Environmental Monitoring Program in Los Alamos County is designed to determine the effect of the operations of the Los Alamos Scientific Laboratory on the surrounding area. Sixty stations throughout the county monitor emissions of gamma radiation; particulates emitting gross alpha, beta, and gamma radiation; tritium, plutonium, and americium in the air; and various air pollutants, e.g., suspended particulates, benzene-soluble matter, beryllium, lead, dust fall, soiling index, and visibility. Water and soil samples are also collected. The measurement results are presented for July-December 1970.

17557 APTIC NO. 35116

Kitamura, Naoji, Ichiro Torii, Sadashi Moriwake, Toshiaki Kasuyama, Shogo Ichikawa, Hirokatsu Okada, Takako Miyake, and Ayamichi Shigeta

ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE, AS CONCLUSION FROM 1965 TO 1971. *(Okayama-ken nabu niokeru taikiosen - 6 nenkan sokutei no matome). Text in Japanese. Okayama-ken Eisei Kenkyusho Nenpo (Ann. Rept. Hyg. Lab. Okayama Prefect.), vol. 18:102-129, March 1971.*

Since 1964, measurements of the amount of dust fall by the deposit gauge method and sulfur oxides by the lead dioxide method have been carried out. With the development of the Mizushima Littoral Industrial District, the amount of fuel consumption has been increasing. In 1970, the Environmental Pollution Monitoring Center (in Kurashiki City) was established, and the surveillance network was arranged with a telemeter system. Also, measures to control pollution by means of collective high chimneys over 100 meters have been taken. Previous countermeasures were mainly related to sulfur oxides control, but measures against dust fall need to be paid more attention, since it has increased. In Okayama City, 80% of the increase was observed in 1968, when sulfur oxides in Mizushima district showed a remarkable increase. High values of sulfur oxides were detected around chemical factories in Kasaoka City and around colcother factories in Mitsu and Takebe district.

17558 APTIC NO. 35081

Kutuzova, L. N., A. I. Kononenko, and G. P. Sokulskii

DISCHARGES TO ATMOSPHERE FROM BENZOLE PLANT. *Coke Chem. (USSR) (English translation from Russian of: Koks i Khim), no. 8:39-42, 1970 6 refs.*

Coke and chemical plants pollute the atmosphere with numerous toxic substances, including hydrocarbons and sulfur compounds. Concentrations of benzene, toluene, xylenes, hydrogen sulfide, and carbon disulfide were determined on a chromatograph with a thermal conductivity detector at a benzol refinery. Chemical analyses were carried out simultaneously for benzene (which was determined by the combustion method), hydrogen sulfide (which was determined by an iodimetric method), and carbon disulfide (which was determined by the xanthogenate method). Phenols were determined in the discharge gas spectrophotometrically, and hydrogen cyanide by the tetrathionate method.

17559 APTIC NO. 35940

Laamanen, Arvo and Timo Partanen

CROSS-CORRELATIONS IN TIME SERIES OF SOME PARTICLE FALL COMPONENTS ON RELATION TO URBAN AREA TYPE. *Suom. Kemistilehti B, 44(11):361-366, 1971. 3 refs.*

Factor analysis was applied in patterning time series of various components of outdoor particle fall at four stations in Helsinki and one station in Tartu. The stations were located in a residential area, an urban background area, a mixed industrial area, an outdoor bus terminal, and near an iron ore processing plant. The particulates were examined for calcium (+), chlorine (-), sulfate ion, titanium, vanadium, copper, nickel, chrome, lead, tin, and manganese. The factor matrix for each station is presented and interpreted. Indirect information about emissions is included in three cases in the form of fuel consumption, industrial production figures, and traffic volume at major effective sources.

17560 APTIC NO. 35828

Mamuro, Tetsuo, Yatsuka Matsuda, Akira Mizohata, Takayuki Takeuchi, and Akira Fujita

NEUTRON ACTIVATION ANALYSIS OF AIRBORNE DUST. *Annu. Rep. Radiat. Cent. Osaka Prefect., vol. 11:1-13, 1970. 7 refs.*

More than 30 elements in airborne dusts in Osaka were determined by instrumental neutron activation analysis by gamma-ray spectrometry with a high-resolution germanium (lithium) detector followed by data processing with an electronic computer. Dust samples at four stations were continuously collected on membrane filters from February 14 to March 14 and June 7 to July 6. Average measured concentrations of each element at each station are summarized. Also listed are the radionuclides used for the determinations and their energies. Almost all were produced by thermal neutron capture. While measured concentrations were lower than maximum permissible concentrations, they were nearly equal to or higher than concentrations measured in heavily polluted urban areas of the U. S. In general, the concentration of an element did not vary over the sampling period. Exceptions were sodium, chlorine, scandium, arsenic, and bromine, which were higher in February-March than in June-July; and potassium, which was higher in June-July than in February-March. Characteristic trends in relative concentrations of several elements were observed for each station. This suggests that measurements of many elements at many more stations will provide valuable information on the real situation of air pollution in a heavily polluted area. Other measured elements included aluminum, vanadium, chromium, manganese, iron, cobalt, nickel, zinc, silver, cadmium, barium, and mercury.

17561 APTIC NO. 35823

Mani, A., B. B. Huddar, and G. P. Srivastava

INTERESTING EVIDENCE OF STRATOSPHERIC DUST FROM ELECTRICAL CONDUCTIVITY MEASUREMENTS. *Curr. Sci., 40(11):290-292, June 5, 1971. 12 refs.*

Electrical conductivity in the stratosphere should be affected by the presence of dust, since the conductivity is proportional to the small ion concentrations. Vertical profiles of electrical conductivity obtained over Poona, India, on March 5, 12, and 14, 1971, and over Delhi on March 9, 1971, are presented. The electrical conductivity increases with height as expected till about 18 km, when it falls sharply to about half its value, with the profile showing a series of marked minima. Above 25-28 km, the conductivity again shows a sharp increase with height. These marked variations in electrical conductivity and potential gradient are presumably associated with the existence of dust.

17562 APTIC NO. 35861

Moyers, Jarvis L., William H. Zoller, Robert A. Duce, and Gerald L. Hoffman

GASEOUS BROMINE AND PARTICULATE LEAD, VANADIUM, AND BROMINE IN A POLLUTED ATMOSPHERE. *Environ. Sci. Technol., 6(1):68-71, Jan. 1972. 18 refs.*

Air quality in Cambridge, Mass. was monitored with activated charcoal and membrane filters to determine concentrations of atmospheric gaseous bromine and particulate lead, vanadium, and bromine. Concentrations in micrograms/cu m as determined by neutron activation analysis were within 0.12-0.45 for gaseous bromine; 0.12-0.94 for particulate bromine; and 0.08-1.32 for particulate vanadium. Lead concentrations were 0.4-3.7 micrograms/cu m as determined by atomic absorption spectroscopy. All particulate species were significantly correlated with each other, indicating atmospheric interrelationships largely explained by meteorological conditions. The correlation of lead with both particulate and total bromine was exceptionally good since lead and bromine came from the same source; however, atmospheric concentrations of bromine were less than supected from the amounts of bromine added to gasoline in ethyl fluid. The lower concentrations could be explained by different residence times for bromine and lead or that some bromine exists in a chemical form not collected by filtration or activated charcoal adsorption. (Author abstract modified)

17563 APTIC NO. 35130

Musserskaya, A. N.

EXPERIENCE IN DETERMINING THE TOTAL AMOUNT OF GAS RELEASED FROM OPEN SURFACES OF WASTE WATER TREATMENT INSTALLATIONS OF MODERN OIL PROCESSING PLANTS. *(Opyt opredeleniya valovykh Gazovydeleniy s otkaytykh poverkhnostey ochistnykh sooruzheniy sovremennykh neftepererabaty-vayushchikh zavodov). Text in Russian. Gigiena i Sanit., no. 9:94-96, 1971.*

The open surfaces of waste water cleaning installations utilized in modern oil processing plants constitute a considerable source of air pollution. Gas emissions from sand trap and settling pond surfaces, as well as from the ascendent flow of the evaporation surfaces of quartz filters and oil trap surfaces were determined by blow off procedures. Hydrogen sulfide and hydrocarbon vapor concentrations were 0.510 and 990.5 mg/cu m, respectively; in samples collected at the filter surface under working conditions. Samples from the sand trap, oil trap, and settling pond surface air contained 0.153, 0.306, and 0.230 mg/cu m H2S respectively and 314.0, 582.0, and 1.800 mg/cu m of total hydrocarbons, respectively. The total hydrocarbon emanations determined at these installation surfaces constituted 30% of the air pollutants found in the air of the respective industrial areas during that particular sampling summer season. The necessity of immediate removal of oil products from the surface of these installations is emphasized in order to decrease the air pollution conditions of the respective area.

17564 APTIC NO. 35150

Odaira, Toshio

AIR POLLUTION CONTROL IN TOKYO. *(Tokyoto no taiki osen seigyo). Text in Japanese. Tokyo Metropolitan Public Nuisance Research Inst. (Japan), Dept. of Investiga-*

tion, Tokyo-New York Environ. Pollut. Symp., Proc., New York, 1970, p. 95-124. (April 13-15.)

The present condition of air pollution in Tokyo, influences, and pollution abatement measures by the municipality are discussed. The consumption of fuels in Tokyo has considerably changed between 1960 and 1968. In 1961, coal was the most used fuel(2.7 mil kt), followed by heavy oil (2.4 mil kl) and gasoline (1.1 mil kl). In 1968, sales of heavy oil were 7.4 mil kl, coal less than 2.0 mil kt, and gasoline 2.6 mil kl. The number of automobiles in Tokyo has changed since 1960 from 60,000 (160 persons/car) to 1.8 mil cars (6 persons/car) in 1968. The total average concentration of sulfur dioxide in Tokyo increased 145% between 1964 and 1969. As a result of concentrated investigations for two weeks in the summers and winter since 1966, high concentrations of SO2 gas were found to flow in the atmosphere 100 to 200 m above the ground in southenly wind. The highest concentrations were found from March to May at 125 m above the ground, and averaged 0.1 to 0.12 ppm (highest 0.7 ppm). The horizontal distribution of carbon monoxide was generally highest along main highways and the concentration diminished proportionately to the distance from the highway. The CO concentrations in the city were greatly influenced by the width of highways, topography, height of the surrounding buildings, and number of passing automobiles; the influences of meteorological factors were not as great on CO from automobiles as they were on emissions from stable sources.

17565 APTIC NO. 35367

Ripperton, Lyman A., and Harvey E. Jeffries

ORGANIC MATTER IN MARINE LIGHT-SCATTERING AEROSOLS. (FINAL REPORT). *North Carolina Univ., Chapel Hill, Dept. of Enviromental Sciences and Engineering, Navy Weather Research Facility Contract N 62306-69-C-0383, E.S.E. Pub. 261, 160p., March 1971. 23 refs.*

NTIS, DDC: AD 724795

Samples of maritime light-scattering aerosols taken at sea in the vicinity of the Virgin Islands in April, July, and September of 1970 proved to contain 35% organic material, showed little response to changes in humidity, and gave evidence of containing the organic fraction of the aerosol as a protective coating on the rest of the particulate material. There was a significant difference in the data taken in the different months which may indicate a seasonal difference. (Author abstract)

17566 APTIC NO. 35941

Schaefer, V. J., V. A. Mohnen, and V. R. Veirs

AIR QUALITY OF AMERICAN HOMES. *Science, 175(4018):173-175, Jan. 14, 1972. 5 refs.*

The sedimentation foil technique was used to measure dust fall inside more than 100 homes in four regions of the U. S. Chicago, Washington, D. C., Atlanta, and Austin. The sedmentation measurements were obtained from the mass collected on aluminum sheets exposed to particulate fallout between December 15, 1970 and January 15,1971. There was a linear relationship between particulate concentrations inside and outside a home. The highest mass in homes with closed windows occurred in urban Chicago and was about one-half the mass collected in homes with open windows. In the progression from an urban to a rural environment, the average mass collected decreased by about a factor of two. In all areas of each region, the mass collected in kitchens and bathrooms was significantly higher than for other rooms.

17567 APTIC NO. 36020

Seba, D. B. and J. M. Prospero

PESTICIDES IN THE LOWER ATMOSPHERE OF THE NORTHERN EQUATORIAL ATLANTIC OCEAN. *Atmos. Environ., 5(12):1043-1050, Dec. 1971. 29 refs.*

Trade wind aerosols in the giant particle size range were collected continuously at Barbados, West Indies, from Nov. 22 to Dec. 4, 1968; the average air concentration of aerosol-borne pp-dichlorodiphenyltrichloroethane (DDT) and pp dichlorodiphenyldochloroethylene, (DDE) during this period was 212 times 10 to the minus 15th power g/cu m. The lack of correlation between atmospheric dust loads and pesticide loads suggests that the pesticide did not become airborne at the same time as the dust, but rather that the pesticide was present in the air prior to the dust event in Africa. Evidence suggests that the pesticides originated from the higher latitudes, either Europe or North America. The possible importance of the wind transport of pesticides to remote marine environments is discussed. (Author abstract modified)

17568 APTIC NO. 35860

Stofft, E., I. Nitsche, and A. Mayet

CONTENT IN FORMALDEHYDE OF THE AIR IN DISSECTING ROOMS. *(Formaldehydgehalt in der Luft der Praepariersaele). Text in German. Zentralbl. Bakteriol., Parasitenk. Infektonskr. Hyg.: Abt. 1: Orig., Reihe B, vol. 155:131-141, 1971. 15 refs.*

The concentration of formaldehyde in the air of dissecting rooms where formalin with isopropylalcohol are used to preserve bodies for dissection was measured. Prior to measurements, sampling apparatus was tested and calibrated. The formaldehyde content of the samples was determined by colorimetry. The air capacity of the dissection halls was 565 and 499 cu m. Concentrations measured on six days varied with the number of students present and place of measurement. In the middle of the halls, concentrations were almost below the maximum allowable concentration (6.0 mg/cu m); concentrations over the dead bodies increased high above the MAC, reaching to 20 mg/cu m. Concentrations were not decreased even with exhaust fans. Formaldehyde content in the basement, where several dead bodies lay in conserving tubs, was up to 10-100 mg/cu m. Period of conservation, air volume, exhaust fans, number of persons present, place of measurement, and room temperature were determined as influencing factors in formaldehyde measurements.

17569 APTIC NO. 36014

Suzuki, Yoshio

RELATION BETWEEN VISIBILITY AND AIR POLLUTION, ESPECIALLY FLOATING DUST, AT TOKYO INTERNATIONAL AIRPORT. *(Tokyo kokusai kuko ni okeru shitei to taiki osen). Text in Japanese. Kenkyo Jiho (J. Meteorol. Res.), 23(8):283-319, 1971. 12 refs.*

The relation between visibility and suspended particulates was investigated at the Tokyo International Airport for variation in diurnal, annual, and year-to-year trends. The occurrence of poor visibility (less than 800 m) has gradually been decreasing from year to year. Dynamical statistics on poor visibility for a five-year period are presented, including meso-scale weather map analyses for several poor visibility occasions. On the basis of aircraft observations of the slant visibility, a schematic model for the mechanism of concentration and diffusion of smoke emitted from factories is derived. (Author abstract modified)

17570 APTIC NO. 35341

Tessari, John D. and David L. Spencer

AIR SAMPLING FOR PESTICIDES IN THE HUMAN ENVIRONMENT. *J. Assoc. Offic. Anal. Chemists, 54(6):1376-1382, Nov. 1971. 4 refs.*

A simple and inexpensive method for analyzing pesticides in air samples is described. The method involves quantitative extraction from a nylon chiffon cloth screen exposed to the atmosphere for five days, followed by cleanup with aluminum oxide and Florisil column chromatography. Recovery of organochlorine pesticides from test screens ranged from 86-100%. The screen method was used to collect inside and outside air samples monthly at the homes of 12 occupationally exposed men (five farmers, seven formulators) for one year. Monthly residue values for the two groups are compared. A high correlation was observed between environmental para, prime-DDT and corresponding levels of para, prime-DDE and para, prime-DDT in blood sera, particularly in the formulator group. The correlation is further evidence of the influence of the household environment on the pesticide body burden. (Author abstract modified)

17571 APTIC NO. 35082

Willis, G. H., J. F. Parr, and S. Smith

VOLATILIZATION OF SOIL-APPLIED DDT AND DDD FROM FLOODED AND NONFLOODED PLOTS. *Pesticides Monitoring J., 4(4):204-208, March 1971. 7 refs.*

The volatility of DDT and DDD applied to uncropped, flooded, and unflooded plots was examined to determine atmospheric concentration gradients and cumulative recovery for each pesticide monitored continuously at 10 and 30 cm above the water or soil surface. Within the first two days, atmospheric concentrations of DDT at 10 cm decreased from a maximum of 1977 to 58 ng/cu m above the flooded plot and from 2041 to 100 ng/cu m above the nonflooded plot, while corresponding levels of DDD decreased from 405 to 30 ng/cu m and from 575 to 92 ng/cu m. Concentrations at 30 cm were comparatively lower; pesticide concentrations at either height seldom exceeded 100 ng/cu m. subsequent changes in atmospheric concentrations were apparently related to climatological factors. The results of measurements determined that the flooding treatment effectively retarded the volatilization of both pesticides. (Author abstract modified)

17572 APTIC NO. 35386

Yanev, B., K. Georgiev, M. Argirova, D. Sergev, D. Balabreva, Iv. Ivanov, Y. Kalpazanov, T. Pavlitsiyan, D. Vachev, L. Mavrov, I. Popov, B. Ivanov, D. Kushev, and N. Uzunov

POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION. *(Zamursyavaneto na prizemnata atmosfera v gr. Pernic i vliyanieto mu vurkhu naselenieto). Text in Bulgarian. Khig. Zdraveopazvane, 10(5):457-471, 1967. 32 refs.*

Complex studies of the hygienic conditions in the industrial city of Pernic, Bulgaria were carried out in 1966. Average monthly concentrations are concerned with the main pollutants, observed at five locations in the city. Dust concentrations (containing 80% particles smaller than five micron) exceeded by almost 100% the permitted limits. Its main constituents were silicon dioxide, arsenic (up to 0.003 mg/cu m), chromium (below one microgram), iron 0.0067 and 0.0130 mg/cu m), and tin (0.0025 0.0041 mg/cu m). Soot concentrations exceeded 1.5 - 2.5 times the allowable limits. Sulfur dioxide exceeded the allowable limits by 1.0 4.5 times during the winter months; hydrogen sulfide exceeded these limits 19 37 times (ranging from 0.096 to 0.275 mg/cu m); carbon monoxide ranged from 5.7 to 25.3 mg/cu m; nitrogen oxides ranged from 0.0004 to 0.1400 mg/cu m; and formaldehydes reached peak values of 0.030 mg/cu m. Aerosols containing sulfuric acid range from 0.015 to 0.380 mg/cu m during the December and May period. The incidence of respiratory disease among the children of Pernic was significantly higher than in a control population. Bronchitis, pharyngitis, laryngitis and tracheitis affected children four to seven years old. Blood glutathione levels in fifty 12-14 year old school girls were 10% lower than those of a control group. Erythrocytic decarboxylation processes were occurring at a 10-17% slower rate in the same group. Reference is made to the geographic location of the city; industrial emissions accumulate, mainly during the winter months, because of temperature gradient inversions occurring in this poorly ventilated area.

17573 APTIC NO. 35534

Yennawar, P. K., S. N. Dixit, V. L. Pampattiwar, J. M. Dave, and S. J. Arceivala

SHORT-TERM AIR QUALITY SURVEYS IN 4 MAJOR CITIES OF INDIA. *Environ. Health, 12(4):355-383, 1970. 5 refs.*

One- to two-month surveys were undertaken to determine the degree of air pollution in four major Indian cities: Bombay, Delhi, Calcutta, and Kanpur. Pollutants measured were sulfur dioxide, hydrogen sulfide, oxidants, suspended particulates, and, in the case of Calcutta, carbon monoxide. Four or five sampling stations were set up in different parts of each city surveyed, and air samples were collected from each station for 24 hr approximately once a week. The data obtained for each city are given separately as average and maximum values for each sampling area. All the cities had dust concentrations two to three times higher than those reported for London, New York, Los Angeles, Chicago, San Francisco, and Cincinnati. Sulfur dioxide levels were uniformly high at all stations in Calcutta and at Delhi stations near railway yards. Bombay had high H2S levels compared to the other cities and also high total oxidant levels near a petroleum refinery. The relatively high CO level in Calcutta suggests that this parameter should be studied in detail in the other cities. There is a strong need for a full-scale investigation of each city.

ATMOSPHERIC INTERACTION

17574 APTIC NO. 35244

WHAT IS SMOG? Res. Cal. Inst. Tech., no. 15, 4p., Jan. 16, 1951.

The most annoying and damaging component of smog may be the organic peroxides that are formed by the reaction of hydrocarbons with ozone and, under the influence of sunlight, with oxygen and nitrogen oxides. The peroxides gather together in large molecules to form aerosols droplets too small to fall to the ground of their own weight, but too big to permit good visibility and thus help to produce the dense haze associated with smog. Organic peroxides meet all the requirements for a damaging component: they are oxidizing to an extreme degree; they cause eye irritation and the specific plant damage that smog causes; and they can occur in large quantities because they are literally made in air from an abundance of compounds seemingly harmless when released.

17575 APTIC NO. 35431

POTENTIAL ENVIRONMENTAL MODIFICATIONS PRODUCED BY LARGE EVAPORATIVE COOLING TOWERS. (FINAL REPORT). *E G and G, Inc., Boulder, Colo., Environmental Services Operation, Federal Water Pollution Administration Contract 14-12-542, Rept. 16130 DNH, 65p., Jan. 1971. 12 refs.*

A study was undertaken to develop techniques to model and predict the behavior of cooling-tower effluents when discharged into the atmosphere under various meteorological conditions. Parameters used in the numerical model are those for typical wet-type natural draft (hyperbolic) towers. Some consideration is also given to the behavior of plumes from mechanical draft towers. In addition to plume dynamics and downwind diffusion, saturation requirements and cloud physics are also considered. Design criteria for the towere are presented. Topographical effects are cited, and seeding effects are discussed. Regional characteristics and site evaluation are mentioned.

17576 APTIC NO. 35666

State Committee of the Council of Ministers USSR for Construction, Gosstroy

RECOMMENDATIONS FOR THE CALCULATION OF DISPERSION IN THE ATMOSPHERE OF NOXIOUS AGENTS (DUST AND SULPHUR DIOXIDE), CONTAINED IN THE EFFLUENTS FROM INDUSTRIAL UNDERTAKINGS. *SN 369-67. Gidrometeorolog. Izdat., 1967. Translated from Russian. Central Electricity Generating Board, London (England), Information Services, 48p.0*

A procedure is recommended for calculating the dispersion of dust and sulfur dioxide discharged to the atmosphere from industrial processes and boiler plants. Single sources and groups of sources are considered. The background pollution of a residential air basin is taken into account, and the boundaries of a health protection zone are determined. An emission inventory is included for which these recommendations pertain. (Author abstract modified)

17577 APTIC NO. 35661

Aitken, John

DUST, FOGS, AND CLOUDS. *In: Collected Scientific Papers of John Aitken, LL. D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press. 1923, Chapt. 8 p. 65-67.*

The action of free surfaces in water and other forms of matter when changing from one state to another is discussed, particularly the role of dust in the cloudy condensation on the vapor in air. In experiments with steam mixed with air, in the air formed free surfaces on which the vapor condensed. It was also found that by heating a platinum wire, its activity was destroyed and all impurities were driven off.

17578 APTIC NO. 35678

Aitken, John

ON THE NUMBER OF DUST PARTICLES IN THE ATMOSPHERE OF CERTAIN PLACES IN GREAT BRITAIN AND ON THE CONTINENT, WITH REMARKS ON THE RELATION BETWEEN THE AMOUNT OF DUST AND METEOROLOGICAL PHENOMENA. *In: Collected Scientific Papers of John Aitken, LL.D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press, 1923, Chapt. 23, p. 297-331.*

An apparatus for testing the condensing power of dust is described, and dust and condensation are discussed. Dust is carried to considerable elevations by the hot air rising over cities, by the hot and moist air rising from sun heated areas of the earth s surface, and by winds driving the dusty air up the slopes of hills. The amount of vapor condensed on the dust in unsaturated air depends on the relative and absolute humidity of the air. The higher the humidity and the higher the vapor tension, the greater is the amount of moisture held by the dust particles when the air is not saturated. Haze is generally produced by dust, and if the air is dry the vapor has only a small effect, while the density of the haze depends chiefly on the number of particles present. None of the tests made of the Mediterranean sea air show it to be very free from dust. The amount of dust in the atmosphere of pure country districts varies with the velocity and the direction of the wind. Fall of wind is accompanied by an increase in dust. Winds blowing from populous districts generally bring dusty air. Meteorological phenomena connected with the amount of dust in the atmosphere are discussed, and relevant field observations are presented. (Author conclusions modified)

17579 APTIC NO. 35681

Aitken, John

ON THE SOLID AND LIQUID PARTICLES IN CLOUDS. *In: Collected Scientific Papers of John Aitken, LL.D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press, 1923, Chapt. 19, p. 247-254.*

Observations were made of the dust and water particles in clouds during a visit to the Rigi Kulm, a mountain elevation. The more dense the cloud the greater was the number of drops falling, and as the cloud thinned away the number gradually decreased. The action of solar radiation with respect to clouds is discussed. It was also attempted to determine whether the density of cloudy condensation depends on the number of dust particles present, or on the number of water particles. Wherever the water particles fell at the rate of about 100 drops per sq mm per min, the limit of visibility in the cloud was about 30 yards, and as the limit of visibility increased the rate of fall decreased. On comparing the densities of a fog and a cloud when the same number of drops fell, it appears that the number of dust particles has a much smaller effect than the number of water particles.

17580 APTIC NO. 35583

Appleman, H.

A NOTE ON THE EFFECT OF AIRCRAFT EXHAUST ON AIRPORT VISIBILITY. *Bull. Am. Meteorol. Soc., 37(1):19-21, Jan. 1956. 8 refs.*

The deterioration of weather conditons at an air base after the landing of jet aircraft at Goose Bay, Labrador, and the ways in which aircraft may affect visibility and ceiling permitting growth of the hygroscopic are considered on the basis of meteorological factor in the area and studies by other investigators. Under certain meteorological conditons, the smoke particles and hygroscopic nuclei in aircraft exhaust can result is a serious deterioration of the weather, especially visibility, over an airfield. The conditions responsible are stability in the lower atmosphere, calm or very light winds, and high relative humidities. Except for absence of a saturation requirement, these are similar to conditons causing radiation fogs. (Author conclusions modified)

17581 APTIC NO. 35763

Atwater, Marshall A.

RADIATIVE EFFECTS OF POLLUTANTS IN THE ATMOSPHERIC BOUNDARY LAYER. *J. Atmospheric Sci., 28(8):1367-1373, Nov. 1971. 18 refs.*

The effect of gaseous and particulate pollutants on the air temperature in the boundary layer was examined by computing their interaction with solar and infrared radiation. The results show that carbon dioxide and ozone in high concentrations are the most important gaseous infrared absorbers. Nitrogen dioxide and high concentrations of sulfur dioxide and ozone produce important heating by absorption of solar radiation. The effect of particles on solar and infrared radiative heating rates computed for realistic numbers, size distributions, and complex refractive indices approaches or exceeds heating rates due to water vapor. (Author abstract modified)

17582 APTIC NO. 35702

Bapseres, P. and J. Molenat

DISPERSION OF POLLUTANTS AND THE MICROCLIMATE AT LACQ. *(Dispersion des polluants et microclimat a Lacq). Text in French. Ann. Mines (Paris), no. 11:21-30, Nov. 1970.*

The natural gas discovered at Lacq in 1951 and exploited since 1956 is a mixture of hydrocarbons, CO2, and water vapor containing 15% hydrogen sulfide. Waste gas emitted into the atmosphere from the desulfurization of this gas and by-product recovery of sulfur contains 0.6% SO2, which under certain meteorological conditions causes widespread damage to feed crops, viticulture, and orchards surrounding Lacq. It was found that not the prevailing SO2 pollution level but rather the coincidence of several meteorological conditions characterized the days on which damage occurred. By analyzing temperature, humidity, wind direction and velocity, precipitation, and insolation and by correlating their levels with the damage to vegetation on certain days, criteria were defined which are helpful in forecasting weather conditions likely to cause damage to crops. When such conditions occur (fog, haze, inversion), an advisory is issued by the Regional Meteorological Center at Bordeaux to the station at Lagor which in turn advises the plant at Lacq. The plant then reduces operations temporarily to minimize damage to crops.

17583 APTIC NO. 35193

Batchelor, G. K.

DIFFUSION FROM SOURCES IN A TURBULENT BOUNDARY LAYER. *Fluid Dyn. Trans., vol. 2:31-40, 1965. 9 refs.*

Dispersion of smoke or dye released from a source at or near a rough rigid boundary, by a turbulent fluid flowing over the boundary, was investigated. When fluid flows over a rough rigid wall, the structure of the turbulence in the constant stress region of the boundary layer is determined wholly by the friction velocity. This allows a similarity hypothesis of a Lagrangian type, i.e., that the statistical properties of the velocity of a marked fluid particle depend only on the friction velocity and the interval of time since the particle was located at a given point. Various consequences of this hypothesis are described. The distribution of mean concentration of smoke or some other passive marking agent released steadily from a fixed source is examined.

17584 APTIC NO. 35268

Bates, Earl M.

FIELD BURNING VS. ATMOSPHERIC VISIBILITY. *In: Research Relating to Agricultural Field Burning. A Progress Report. Oregon State Univ., Corvallis, Agricultural Experiment Station and Oregon State Univ., Corvallis, Air Resources Center, p. 23-24, Feb. 1971.*

To manage smoke from field burning in a way that is consistent with desirable air quality, it is necessary to know the magnitude of the source and the volume of the container (surface area of the valley). The effective depth of the valley equals the height to which smoke can be lifted by atmospheric dynamics. Inversions near 3000 ft or lower occur in the July-August-September period in the Willamette Valley, Oregon; over half of these persist into the afternoon. Large-scale field burning overloads the air, contributing to poor visibility. A method for predicting maximum acreage to be burned consistent with good air quality is being improved. An inverse relationship exists between atmospheric stability at 3000 ft and visibility in the valley. Rainfall climatology is noted. In a burning period of 65 days, about 25 can be expected to be meteorrologically suitable for open field burning.

17585 APTIC NO. 35776

Bibbero, Robert J.

SYSTEMS APPROACH TOWARD NATIONWIDE AIR-POLLUTION CONTROL. III. MATHEMATICAL MODELS. *IEEE (Inst. Elec. Electron. Engrs.) Spectrum, 8(12):47-58, Dec. 1971. 44 refs.*

Future air-pollution control systems will be equipped with sensors to monitor the current status of local air pollution and meteorological factors such as wind, stability, or mixing depth. The systems will be furnished not only with data on the location and strength of pollution sources and synoptic weather conditions, but with information needed to forecast air quality for a period of 24 hr or more. Mathematical models of pollution dispersion will provide a valuable predictive tool. A mathematical model may also be used to evaluate alternate means of source control. Introduction of cost factors permits this evaluation to be on a cost-effective basis. The decision process may be mechanized through linear programming routines. Various analytical models are discussed for air resource management, diffusion, and preduction. Several state and local continuous monitoring networks are described including computers, alert procedures, and objectives.

17586 APTIC NO. 35433

Binford, F. T., T. P. Hamrick, and Beth H. Cope

SOME TECHNIQUES FOR ESTIMATING THE RESULTS OF THE EMISSION OF RADIOACTIVE EFFLUENTS FROM ORNL STACKS. *Oak Ridge National Lab., Tenn. ORNL-TM-3187, 169p., Oct. 1, 1970. 18 refs.*

NTIS: ORNL TM3187

Annual average ground-level concentrations of radioactive materials, based on stack dilution factors, were obtained for each of the five stacks at the Oak Ridge National Laboratory. Maximum permissible release rates for the five stacks were determined by establishing an effective area perimeter and estimating annual average concentrations from continuous emission at various locations. The calculation procedure took into account the time variation of meteorological conditions and that of activity release rates. The time dependence of meteorological conditions was considered by utilizing data samples providing an estimate of the joint frequency of occurrence of various wind velocity vectors and atmospheric stability conditions. Log-polar plots showing expected annual average stack-dilution factor isopleths for each stack allowed the environs to be studied in sufficient detail. Radiation doses following an accidnetal release were estimated by computation of coordinates of isopleths of time integrated ground-level concentrations in the path of a plume generated by an inadvertent release. Calculated annual average ground-level concentrations agree with measured values within a factor of two.

17587 APTIC NO. 35643

Bull, G. A.

BLUE SUN AND MOON. *Meterorol. Mag. (London), 80(943):1-4, Jan. 1951. 7 refs.*

Over much of western Europe between September 26 and 30, 1950, the sun and moon were seen blue in color. The color assumed by the sun was described from steel gray to deep blue, royal blue, or purple. On Sept. 27, an aircraft pilot encountered a brown haze with the smell of burned paper at 30,000-32,000 ft. The optical phenomena were caused by smoke from a forest fire in Alberta, Canada, 340 miles northwest of Edmonton. Over eastern Canada and the northeastern United States the smoke clouds were thick enough to blot out the sun and to cause lights be be turned on in buildings and streets. Upper air charts for this period showed that the upper winds over the Atlantic were favorable for carrying the smoke to Europe. The optical theory of the blue or green appearance of the sun is not yet worked out.

17588 APTIC NO. 35203

Bultynck, H. and L. Malet

TURBULENT DIFFUSION OF EFFLUENTS EMITTED CONTINUOUSLY INTO A STABLE ATMOSPHERE BY AN ELEVATED EMISSION SOURCE. VOLUME II (FIGURES). *(Diffusion turbulente des effluents emis dans l atmosphere par une source elevee a emission continue en relation avec la stabilite de l air. Tome II (figures)). Text in French. Centre de etude de l Energie Nucleaire, (Brussels, Belgium) Mesure et Controle des Radiations, BLG 434, 82p., 1969.*

Eighty-two photographs, a map, graphs, drawings, diagrams, punch card examples demonstrating programming and perforation, and microscopic photographs related to the text of volume I are presented. The photographs depict the site at the Centre d Etude de l Energie Nucleaire at Mol-Donk in Belgium, the meteorological pylone, and the instruments used in the study. The graphs illustrate the measurement of wind vector intensity, the behavior of the weather vane and anemometer, recording methods, and elements of the mathematical analysis of turbulent diffusion, and the microphotographs depict microscopic views of aerosols.

17589 APTIC NO. 35629

Bultynck, H. and L. Malet

TURBULENT DIFFUSION OF EFFLUENTS EMITTED CONTINUOUSLY INTO A STABLE ATMOSPHERE BY AN ELEVATED EMISSION SOURCE. VOLUME I (TEXT). *(Diffusion turbulente des effluents emis dans l atmosphere par une source elevee a emission continue en relation avec la stabilite de l air. Tome I (text). Text in French. Centre d Etude de l Energie Nucleaire, Brussels (Belgium), Mesure et Controle des Radiations, BLG 434, 127p., 1969. 37 refs.*

Turbulent diffusion in the atmosphere was studied to explain the behavior of air layers and to precisely define the diffusive characteristics of effluents as a function of different atmospheric factors, in order to achieve maximum dispersion of pollutants the lowest possible levels of air pollution. Fluctuations of the wind vector were measured at the effluent discharge level of the factors of the Centre de Etude de l Energie Nucleaire at Mol-Donk, Belgium, and thermal and wind conditions were determined to a height of 120 m above ground. The determination of a simple correlation between the dilution factors of effluents and a parameter of stable atmosphere which can be ascertained without expensive equipment was sought, using a mathematical diffusion model and computer. Results showed that within the interval of variation of the parameter S (the degree of atmospheric stability), the dependence of sigma y or sigma z (distances separating emitted particles from the axis of symmetry of the plume) on S obeyed a hyperbolic law. Tracer experiments are described and results compared with similar experiments carried out in the U. S. Data concerning the wind vector were obtained by statistical analysis.

17590 APTIC NO. 35753

Burton, Robert W.

ON AFFECTING THE LONG-TERM AIR QUALITY IN THE SAN FRANCISCO BAY AREA. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Syst. Man Cybern., 1(4):307-313, Oct. 1971. 11 refs.*

Using a simple homogeneous mixing model of the San Francisco air basin as an illustration, a maximum pollution-level constraint for particulates, organic pollutants, nitrogen oxides, sulfur oxides, and carbon monoxide was derived using the air quality standards of California. Meteorological factors, e.g., wind conditions and inversions, were determined. Since pollution derived from transportation is considered to be the major source function, an analytical model was developed whereby state or federal decision makers can trade off various transportation options in order to meet the demands of an ever increasing commuting public while at the same time staying within a given pollution-level constraint. Although the approach presented is developed using derived data assuming a simple homogeneous mixing model and specifically addresses the transporation problem, the tradeoff approach is easily generalized to accepting data derived from more sophisticated models as they become available as well as extended to other sources of pollution such as power plants and industrial systems. (Author abstract modified)

17591 APTIC NO. 35409

Byzova, N. L. and R. I. Onikul

ANALYSIS OF CONCENTRATION RANGE OF A HEAVY CONTAMINANT ON THE BASIS OF DATA FROM A 300-METRE HIGH METEOROLOGIC TOWER. *(Analiz polya kontsentratsiy tyazheloy primesi po dannym opytov na 300-metrovoy meteorologicheskoy bashne). Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), no. 172:35-41, 1965. 8 refs.*

Data on the diffusion of a heavy contaminant, measured for two years on a 300-m meteorologic tower, were evaluated using a turbulent diffusion equation. Experimental and calculated results showed good agreement, indicating that the assumptions employed relating to convection conditions were correct. From data on deposition, the concentrations of various fractions of a contaminant were calculated to determine the dependence of maximum surface concentrations on source height, wind velocity, atmospheric stratification, and particle fallout rate.

17592 APTIC NO. 35451

Calvert, Jack G.

PHOTOACTIVATED SURFACE REACTIONS. *Air Pollut. Found. Rep., no. 15:89-112, 1956 (?). 44 refs. (Presented at the Air Pollution Foundation, Conference on Chemical Reactions in Urban Atmospheres, Los Angeles, Calif., Nov. 1956.)*

Photoactivated reactions on solid surfaces are reviewed to provide a background for the proper evaluation of the possible contribution of particulate matter to smog-forming reactions. The photochemistry of solids; photosensitized reactions at solid zinc oxide surfaces and of zinc oxide in nonaqueous solutions and gaseous media; and photoactivated peroxide formation and additive oxidation on ZnO-like solids are discussed. Reactions of titanium dioxide are listed, including the photosensitizing action of antimony oxide. The photocatalytic action of miscellaneous metallic oxides is considered in liquid-phase oxidations and in the decomposition of hydrogen peroxide. The photochemical oxidation of gaseous hydrogen selenide and the gas-phase oxidation of carbon monoxide photosensitized on cuprous oxide solid are described. Photosensitized reactions at transparent solid surfaces are noted, and general characteristics of solid photosensitizers are summarized. Possible contributions of photoactivated surface reactions to smog formation are considered.

17593 APTIC NO. 35536

Chester, R., H. Elderfield, and J. J. Griffin

DUST TRANSPORTED IN THE NORTH-EAST AND SOUTH-EAST TRADE WINDS IN THE ATLANTIC OCEAN. *Nature (London), 233(5320):474-476, Oct. 15, 1971. 10 refs.*

The importance of wind transport for the introduction of land-derived material to the oceans varies from one area to another, and the highest reported content of dust is found in the north-east trade wind system over the North Atlantic Ocean, but there seem to be no data on the dust loadings in the south-east trades of the Atlantic. To establish the concentrations and kind of dust in this important wind system, collections were made during July and August 1970 in both the SE and NE trades of the Atlantic Ocean between 16 deg S and 23 deg N. The dusts were collected on nylon meshes, and the volume of wind passing through the meshes was calculated using a calibrated anemometer. Dusts collected in the SE trades between about 16 deg S and the equator have an average concentration of 0.55 microgram cu m of air, and are predominantly brown or gray in color. There was a dramatic change in dust loadings when the ship entered the NE trades; the red-brown dusts have an average concentration of 24.5 micrograms/cu m of air. Particle size, mineralogy, and origin of the dusts are discussed.

17594 APTIC NO. 35420

Chirakadze, G. I.

THE CLIMATE OF TIBILISI AND OF ITS NEW BOUNDARIES. *(Klimat Tbilisi v novykh granitsakh. Text in Russian. Tr. Zakavkaz. Nauch.-Issled. Gidrometeorol. Inst., 26(32):3-75, 1967. 23 refs.*

A tentative analysis of the climatic conditions of the city of Tbilisi and its surrounding areas is presented. Temperature, humidity, wind, sunshine and fog are being considered among the main meteorological factors affecting the air pollution of the city. The inversion phenomena developing in the lower section of the city, which is part of the Kura valley, lead to a weakening of the exchange processes and preclude the effects of turbulence on the ventilation of the city. Humidity affects the microclimatic condition of the city in that the existence of suspended dust particles (due to poor road conditions) in its air constitute the condensation nuclei for the formation of fog. Fogs are formed under conditons of 90% humidity, whereby a considerable increase in industrial waste gas concentrations in observed. Haze is considered to be the most specific fog for Tbilisi and is therefore being used as an indirect parameter in the assessment of the air pollution of the city. Rainfall and ventilation are considered to be the meteorological factors determining the removal of aerosols. Both, however, are compromised by long periods of lack of precipitation, ranging between 30-60 days during the summer or winter season and by the orographic features of the city. A program of intense research in the fight of air pollution due to local factors such as coal heating, industrial pollution, poor road conditions and waste accumulations from building activities, is recommended. It includes problems such as the sources of pollution, the chemical composition of aerosols, the admissible standards of pollution, the effect of aerosols on the biological and corrosive processes and the role of pollution for further urbanistic developments of the city.

17595 APTIC NO. 35690

Chuang, H. and J. E. Cermak

THE DIABATIC WIND AND TEMPERATURE PROFILES. *Colorado State Univ., Fort Collins, Fluid Dynamics and Diffusion Lab., Army Research Grant DA-AMC-28-043-65-G20, Proj. 2246, CER69-70HC-JEC-18, 24p., Dec. 1969. 10 refs.*

NTIS, DDC: AD 724159

The KEYPS model and the Monin-Obukhov long-linear model were examined for their ability to describe wind and temperature profiles in thermally stratified shear flows of diversified stability. The dimensionless wind shear and lapse rate for all ranges of thermal stability studied, -2.0 less than or equal to Ri less than or equal to 0.4, were linearly dependent on the dimensionless height derived from the log-linear model. Deacon numbers behaved quite differently than predicted by the KEYPS model. (Author abstract modified)

17596 APTIC NO. 35575

Clodman, J.

VISIBILITY DETERIORATION ASSOCIATED WITH OPERATIONS OF JET AIRCRAFT. *Bull. Am. Meteorol. Soc., 37(7):338-341, Sept. 1956. 6 refs.*

The possibility of significant visibility deterioration due to landings of jet aircraft in a cloud and snow situation was discussed. Aircraft may modify precipitation processes by intensifying local moisture and temperature gradients. Conditions likely to be conducive to visibility deterioration are low temperatures particularly below minus 30 C, large numbers of aircraft, light winds, and relatively low precipitating clouds. It is probably not necessary to have all of the conditions fulfilled in order for the effect to be felt. The incident at Goose Bay, Labrador is an example of this phenomenon with temperatures above minus 30 C. However, the departure from ideal conditions probably would have to be small before significant deterioration would occur. When the ideal conditions are fulfilled, it would be advisable to take certain precautions. The descent and landings of a number of jet aircraft should be so spaced that the products of the exhaust of one aircraft would be dissipated before the next descends preparatory to landing. The strength of the low-level winds would be a guide in this regard. (Author conclusions modified)

17597 APTIC NO. 35226

Clough, W. S. and J. A. Garland

THE BEHAVIOUR IN THE ATMOSPHERE OF THE AEROSOL FROM A SODIUM FIRE. *Atomic Energy Research Establishment, Berkshire (England), AERE R-6460, 14p., 1970. 10 refs.*

NTIS: AERE-R-6460

The behavior in the atmosphere of aerosols generated by a sodium fire was studied. The chemical form and physical size of the particles are modified by the presence of oxygen, water vapor, and carbon dioxide in the atmosphere. The chemical form under various conditions was predicted and the equilibrium droplet size for a given sodium compound was calculated as a function of sodium mass and relative humidity. The formation of sodium carbonate from sodium hydroxide droplets is controlled by liquid phase diffusion of reactants in the drops and probably occurs in less than a few minutes. The formation of sodium bicarbonate from sodium carbonate droplets is much slower, and delays of tens of hours may elapse before equilibrium is achieved. (Author conclusions modified)

17598 APTIC NO. 35208

Culkowski, W. M. and G. A. Briggs

METEOROLOGICAL BEHAVIOR OF COMBUSTION PRODUCTS RELEASED AT THE BLANCO PLANT. *In: Theoretical Evaluation of Consumer Products from Project Jet Gasbuggy. Final Report, Phase I: Impact of Hypothetical Releases of Contaminated Gas in the San Juan Basin. Oak Ridge National Lab., Tenn., Health Physics Divison, Atomic Energy Commission Contract W-7405-eng-26, Rept. UC-41-Health and Safety, p. 34-38, Sept. 1971. 36 refs.*

NTIS: ORNL-4646

The probable behavior of combustion products released at the Blanco plant was estimated on the assumption that wind data from Farmington, New Mexico, are representative of the area. Separate estimates were made for each source of release at the plant: flare pit, compressor plant, and boiler plant. The contribution to the plant area from the flare pit would be about the same as to the residential area: both areas will be affected by winds with speeds over 10 mph. The contribution to the plant area from the boiler plant and compressors would be greater, and personnel in buildings immediately to the east of these sites may be exposed to an annual average concentration of combustion products three times that of the residential area. Downwash of plumes from compressor-plant stacks would begin at about three to six mph, while downwash from boiler-plant stacks would commence at about six mph.

17599 APTIC NO. 35222

Detwiller, J.

CENTENNIAL EVOLUTION OF THE CLIMATE OF PARIS. THE INFLUENCE OF ITS URBANIZATION. *(Evolution seculaire du climat de Paris. Influence de l urbanisation). Text in French. Mem. Meteorol. Nat., no. 52:1-82, 1970. 67 refs.*

NTIS: N71-24057

Various meteorological stations in and around Paris provided data giving maximum, minimum, and average temperatures, solar radiation, number of hours of sunshine per year, number of days per year with temperatures below freezing point, last day of the winter period when the temperature amounted to zero degree C or below, years in which the river Seine was frozen, rainfall, wind direction, wind velocity, visibility, fog formations, and other phenomena. These data are given as charts, ranging over the last 100 to 160 years. The statistics are interpreted, such as the upward trend of average temperatures, in the light of increased urbanization. The decrease in polar ice area and the receding of glaciers have tended to raise temperature averages on a global basis. The diminished quality and quantity of solar energy received, as observed in recent years, has been largely due to air pollution. Yearly rainfall in the Paris area has increased by about 13% since 1873. Industrial activity can possibly play a part in the formation and quantities of precipitation. 0

17600 APTIC NO. 35987

Dmitriev, M. T., T. V. Solovieva, and N. A. Kitrossky

THE PHYSICOCHEMICAL MECHANISM OF OZONE AND PHOTOOXIDANTS FORMATION IN THE ATMOSPHERE. *(O fiziko-khimicheskom mekhanizme obrazovaniya ozona i fotooksidantov v atmosfernom vozdukhe). Text in Russian. Gigiene i Sanit., 36(10):6-10, 1971. 8 refs.*

A physicochemical mechanism of ozone and photooxidant formation in the atmosphere is described. The formation of ozone and photooxidants in a polluted atmosphere in the presence of nitrogen oxides and hydrocarbons takes place under the action of solar radiation. Photooxidant concentrations vary depending upon different meteorological factors and height above the ground; concentrations increase up to 12-14 stories, then decrease until 26-27 stories when the level of ozone in comparatively pure air is attained.

17601 APTIC NO. 35567

Eddy, Amos

SIMULATION OF ECOLOGICAL SYSTEMS. *Air Weather Service, Washington, D. C., Proc. Air Weather Serv. Tech. Exch. Conf., Annapolis, Md., 1970, p. 311-322. 4 refs. (Sept. 21-24.)*

NTIS, DDC: AD 724093

An ecosystem simulation model is examined with respect to technical difficulties of development, conceptual problems, structure, population dynamics, and application to resource management. The atmospheric submodel for climactic predictions is based on data of wind speeds and directions, relative humidity, temperature, clouds, lapse rates, rainfall, and geographical relationships. Air pollution patterns are produced using identified sources and a statistical-dynamical prediction model.

17602 APTIC NO. 35246

Eschenroeder, A. Q. and J. R. Martinez

FURTHER DEVELOPMENT OF THE PHOTOCHEMICAL SMOG MODEL FOR THE LOS ANGELES BASIN. (FINAL REPORT). *General Research Corp., Santa Barbara, Calif., Air Pollution Control Office Contract EHSD 71-22, 60p., March 1971. 34 refs.*

NTIS: PB 201737

A diffusion model with photochemistry is derived for the Los Angeles basin that is applicable to pollutants that undergo chemical changes. An attempt was made to keep the mathematical descriptions near the level of detail and precision of observational data, resulting in a lumped-parameter, chemical kinetic mechanism and a Lagrangian air parcel with finite-rate vertical diffusion. The coordinate system is aligned with the natural airflow at each instant so that there is practically no advection across any grid line. Kinetic improvements in the photochemical description over previous models include additional oxidation chains, synergism between hydrocarbons, the influence of the nitrogen oxides/hydrocarbons ratio on oxidant production, and the effects of carbon monoxide. Pade approximants were applied to smog chamber calculations and the atmospheric model equation. The model was tested against Los Angeles basin data.

17603 APTIC NO. 35495

Esmen, Nurtan A. and Morton Corn

RESIDENCE TIME OF PARTICLES IN URBAN AIR. *Atmos. Environ. (London), 5(8):571-578, Aug. 1971. 8 refs.*

Five preliminary tests were conducted to determine particle residence times in dry urban atmospheres. In each test, a membrane filter was exposed on a roof for four hours to collect settled particles in the horizontal plane. The ground-level concentration of suspended particulate matter was measured by simultaneoulsy sampling at 6.5 l/min with another membrane filter. From microscopic sizing and counting of particles on each filter, a ground-level particle concentration and a ground-level particle flux were defined for various particle-size groups. The results indicate that submicron particles in the absence of precipitation have a mean residence time on the order of 100-1000 hr. Particles from one to 10 micron in diameter have residence times of 10-100 hr, respectively. The consistent lack of particles greater than 20 micron indicates that the mean residence time of these particles is on the order of, or less than, the transport time necessary for their arrival at the sampling site.

17604 APTIC NO. 35045

Fan, L. T. and Y. Horie

REVIEW OF ATMOSPHERIC DISPERSION AND URBAN AIR POLLUTION MODELS. *CRC Critical Rev. Environ. Control, 2(3):431-457, Oct. 1971. 200 refs.*

Most air pollution models employ the Gaussian dispersion formulas to determine the concentration of pollutants emitted from numerous sources and the resulting distribution. The Gaussian dispersion formulas are based on the symmetry of a diffusing cloud in the x, y, and z directions with respect to the plume s axis or puff center. However, it is usually difficult to observe such symmetry in actual smoke plumes. In spite of the successful application of the Gaussian dispersion formulas to the prediction of long-term average concentrations and their distributions, applications of the formulas to a short-term prediction do not appear to be very successful. Possible reasons for this are cited. Adaptive prediction based on the so-called box model may have greater applicability to a short-term prediction because it can utilize the information of past stochastic events. Recently, a dispersion formula similar to the formula which appeared in Monin s similarity theory of atmospheric diffusion was successfully applied to a short-term prediction as well as a long-term prediction. Stability of the atmosphere, vertical distribution of wind and temperature, and atmospheric turbulence are considered. Atmospheric dispersion and urban air pollution models are discussed.

17605 APTIC NO. 35357

Fett, Walter and Erdwin Lahmann

EXTRAORDINARY CARBON MONOXIDE CONCENTRATIONS IN THE AIR OF MAJOR CITIES. *(Aussergewoehnliche Kohlenmonoxid-Konzentrationen in Grosstadtluft). Text in German. Bundesgesundheitsblatt, 13(5):59-62, 1970. 10 refs.*

During a 10-month period of continuous air pollution in a lightly-traveled street 3 km from the center of Berlin, the median half-hour carbon monoxide level of 8 ppm rose suddenly on Dec. 9, 1969 to very high levels, characterized by two peaks of 23 ppm. This high lasted for nine hours. The simultaneous half-hour SO2 concentration was 1.03 mg/cu m and the median three-hour dust fall was 0.47 mg/cu m. This episode coincided with the advent of a cold arctic air mass over Germany which spread over Berlin on December 9 and brought all air movement to a standstill. This extreme phenomenon indicates that under conditions of weather inversion emission clouds can form, possibly with their own circulation in which condensation processes and irradiation may play a stabilizing role. Under such circumstances, the atmosphere itself can erect barriers leading to a local accumulation of pollutants which otherwise are formed only by topographic interactions.

17606 *APTIC NO. 35207*

Gillette, Dale Alan

A STUDY OF AGING OF LEAD AEROSOLS. Michigan Univ., Ann Arbor, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1970, 195p. 61 refs.

The aging of lead aerosols was studied by determining size distributions of collected lead aerosols and by performing a numerical simulation experiment. To investigate differences of lead aerosol size distributions in different source regions (areas of high automobile traffic), lead aerosols were collection in one urban area (Chicago) and in cities of 100,000-200,000 population (Ann Arbor, Michigan and Lincoln, Nebraska). to investigate the response of the lead size distribution to different weather conditions, a series of samples was collected in Ann Arbor for 24-hr sampling periods and the weather data were recorded. To obtain aged lead aerosols, samples were taken over Lake Michigan, where no sources of lead aerosol exist. The ages of the aerosols were assumed to equal the travel time over the lake before collection. The samples were collected with cascade impactors and analyzed by anodic stripping voltametry. A mathematical model was constructed as a simulation experiment to separate aerosol aging effects and to determine aging effects not due to weather variation. The simulation experiment showed rapid lead coagulation removal for particles with a radius less than 0.04 micron and gravitational sedimentation removal for particles with a radius greater than five micron. As determined by both observational and simulation studies, little change of the lead spectrum occurred within a 10-hr period.

17607 APTIC NO. 35573

Hales, J. M., J. M. Thorp, and M. A. Wolf

FIELD INVESTIGATION OF SULFUR DIOXIDE WASHOUT FROM THE PLUME OF A LARGE COAL-FIRED POWER PLANT BY NATURAL PRECIPITATION. (FINAL REPORT). *Battelle Memorial Inst., Richland, Wash., Atmospheric Sciences Dept., Air Pollution Control Office Contract CPA-22-69-150, 214p., March 1971. 68 refs.*

NTIS: PB 203129

Sulfur dioxide washout by natural precipitation from the plume of a coal-fired power plant was investigated to assess the extent of depletion from the diffusing plume and evaluate the possible consequences arising from deposition at the surface. Washout was up to two orders of magnitude less than predicted by existing theories. No significant differences were determined between washout fluxes in rain and snowfall. The observed relationship between washout and precipitation rate differed by a factor of two from the relationship derived from existing theories, suggesting more efficient washout by large drops. Washout concentrations of SO2 increased with distance from stacks. Washout of background SO2 caused an inordinately strong interference with plume washout observations. Under certain circumstances, when washout of background SO2 was relatively high, a depression of SO2 concentration was determined in precipitation collected beneath the plume. (Author summary modified)

17608 APTIC NO. 35749

Halliday, E. C. and G. Venter

DISCUSSIONS. A NUMERICAL EXPERIMENT IN SIMULATING THE TRANSPORT OF SULPHUR DIOXIDE THROUGH THE ATMOSPHERE. *Atmos. Environ., vol. 5:815-818, 1971. 1 ref. (Includes a reply by D. Randerson.)*

A previously published paper in which the pollution in an area covered by an array of emitters was assessed is examined. This lends itself to a numerical solution because a series of n equations giving the effect of n emitters at the point of interest can be handled effectively by a computer for steady state conditions. Randerson attempted to solve such a problem but allowing for the transport and the decay of the pollutants. The present paper suggests that there is some deficiency in the assumptions made when the model was derived. On the basis of field experiments, an area source of pollution was indicated to produce a gradient of concentration in all directions, radially from the center. With no wind the source is surrounded by contours of isometric concentration. When there is a wind, these isometric contours 0are displaced in the direction of the wind so that the windward side of the contours are pushed closer together, while on the leeward side they are spread further apart. However, the point of maximum concentration is hardly moved at all. The center of greatest concentration in the predicted system of Randerson has moved from where it appeared on the grid system of contours.

17609 APTIC NO. 35497

Hanna, Steven R.

A SIMPLE METHOD OF CALCULATING DISPERSION FROM URBAN AREA SOURCES. *J. Air Pollution Control Assoc., 21(12):774-777, Dec. 1971. 17 refs. (Presented at the Conference on Air Pollution Meteorology, April 6, 1971.)*

A simple but physically realistic model is shown to be adequate for estimating pollutant concentrations due to area sources in cities. In this model, the surface concentration is directly proportional to the local area source strength and inversely proportional to the wind speed. The model performs nearly as well as much more complex models that require the use of digital computers. (Author abstract)

17610 APTIC NO. 35075

Hazbun, E. A., J. Cramer, and A. L. Myers

KINETIC MODEL OF PHOTOCHEMICAL SMOG FORMATION. *Environ. Letters, 1(1):17-27, 1971. 11 refs.*

A kinetic model of photochemical smog formation is examined. The model consists of thirteen generalized chemical reactions, with atmospheric diffusion, convection, and deposition effects introduced by means of a time-dependent removal function, time-dependent generation functions to account for stationary and moving sources of hydrocarbons and nitrogen oxide, and ultraviolet radiation introduced by a solar irradiance factor as a function of the sun zenith angle. Rate equations for nitrogen dioxide, nitric oxide, ozone, hydrocarbons, aldehydes, ketones, and alcohol are calculated.

17611 APTIC NO. 35853

Hecht, Thomas A. and John H. Seinfeld

DEVELOPMENT AND VALIDATION OF A GENERALIZED MECHANISM FOR PHOTOCHEMICAL SMOG. *Environ. Sci. Technol., 6(1):47-57, Jan. 1972. 44 refs.*

A detailed 81-step mechanism for the photooxidation kinetics of the propylene-nitrogen oxide-air system, based on considerations of the possible reactions which might be occurring, is examined. A general mechanism for photochemical smog formation was deduced from this. The flexibility of the mechanism lies in adjustable rate constants and stoichiometric coefficients chosen according to the particular hydrocarbon and initial reaction ratios. The general mechanism is validated with smog chamber data on propylene, isobutylene, n-butane, and a mixture of propylene and n-butane. The effect of carbon monoxide on smog chamber photooxidation kinetics as well as the inhibitory effect of high initial concentrations of nitric oxide on the maximum concentration of ozone attained were accurately simulated. (Author abstract modified)

17612 APTIC NO. 35630

Helbig, H. S.

BACKSCATTER STUDIES IN FOG USING LASER TECHNIQUES. *(Untersuchung der Rueckstrahlungsbedingungen im Nebel mittels Laser-Verfahren). Text in German. Deutsche Forschungs- und Versuchsanstalt fuer Luft-*

und Raumfahrt e.V. (West Germany), Inst. fuer Physik der Atmosphaere, 37p., Nov. 1970. 11 refs.

NTIS: N7124462

Optical backscatter by fog is theoretically investigated and compared with experimental data obtained by a laser device. The laser device serves as an optical probe enabling remote determination of fog characteristics as well as targets hidden in the fog. Suggestions are made for further development of the laser technique. (Author summary modified)

17613 APTIC NO. 35601

Holzworth, G. C.

LARGE-SCALE WEATHER INFLUENCES ON COMMUNITY AIR POLLUTION POTENTIAL IN THE UNITED STATES. *J. Air Pollution Control Assoc., 19(4):248-254, April 1969. 17 refs.*

The large-scale weather features that typically are associated with relatively rapid and slow atmospheric dispersion are described. Widespread conditions of slow atmospheric dispersion, lasting the order of days, usually occur with warm anticyclones. Such high-pressure systems are typified by slow movement, sluggish winds, subsidence, and inhibited vertical mixing. These characteristics are variously illustrated for the well known air pollution incident at Donora, Pa. in 1948 and several other episodes. Large-scale dispersion features can be assessed in terms of morning and afternoon mixing heights and vertically averaged wind speeds through these layers. Mean monthly values of these variables are presented for St. Cloud, Minn., Washington, D. C.; Denver, Colo.; and Oakland, Calif. Generally, the mean morning mixing heights are a few hundred meters throughout the year; the afternoon values in winter range from several hundred to about 1000 m, and in summer, from about 600 m at Oakland to over 3000 m at Denver. The mean wind speeds are roughly 2 m/sec faster in the afternoon than in the morning. Using mixing height and wind speed data for individual days, the episodal nature of limited dispersion is assessed. An episode of limited dispersion is defined as no mixing height greater than 4.0 m/sec, and no precipitation, all for at least two days. In five years the total number of such episode-days at St. Cloud was three; at Washington and Denver about 40; and at Oakland, it was over 200. (Author summary modified)

17614 APTIC NO. 35230

Hoven, I. van der

ATMOSPHERIC TRANSPORT AND DIFFUSION IN THE PLANETARY BOUNDARY LAYER JANUARY - JULY 1970. *National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Labs., NOAA TM-ERL-ARL-28, 47p., Jan. 1971. 6 refs.*

NTIS: COM-71 00353

Research projects on mesoscale lagrangian studies, mixing length hypotheses, and planetary boundary layer dynamics were presented. Mesoscale lagrangian studies included Lagrangian-Eulerian relationships, urban wind structure studies, the representativeness of Reynolds stresses from tetroon flights, and urban wind and air pollution studies. Research included mesoscale transport studies, mesoscale forecast, the surface winds at the CFA station, and an aircraft wake turbulence interagency study. Mesoscale transport studies included comparisons of trajectories derived from wind fields and single station wind data, trajectory statistics for selected receptors, error checking and correction, comparison of tetroon and wind field trajectories, and animation of trajectory plots.

17615 APTIC NO. 35993

Hunt, B. G.

A DIFFUSIVE-PHOTOCHEMICAL STUDY OF THE MESOSPHERE AND LOWER THERMOSPHERE AND THE ASSOCIATED CONSERVATION MECHANISMS. *J. Atmospheric Terrest. Phys., 33(12):1869-1892, 1971. 61 refs.*

The photochemical composition of an oxygen-hydrogen atmosphere extending from 60-160 km was computed from a diffusive-photochemical model making allowance for both molecular and eddy diffusion. Methane was included in the model to investigate its importance as a source of hydrogen in the upper atmosphere. The composition was calculated for photochemical equilibrium, diffusive-photochemical equilibrium, and for diurnally varying diffusive-photochemical conditions. The eddy diffusion coefficient was assumed to increase with height up to 100 km, and then to remain constant. Numerical values are given for the mechanism by which the oxygen content of the atmosphere is conserved in the face of dissociative and diffusive losses. The downward flux of atomic oxygen from the thermosphere converges below about 90 km, the recombination to molecular oxygen occurring via reaction with hydrogen compounds. A quasi-conservative mechanism exists for hydrogen gases in the atmosphere, local production of water vapor, and molecular hydrogen; the mechanism significantly reduces the net loss of hydrogen to space. The formation of molecular hydrogen in the mesosphere, which is partially due to photolysis of methane, produces a distinct source region which supplies both thermosphere and stratosphere. Comparison of the calculated gas profiles with observations indicates the need for more extensive measurements of the gas distributions in the upper atmosphere to place better limits on photochemical calculations. Results are also given for the hydroxide airglow emission and for the 5577 A airglow of atomic oxygen. (Author abstract modified)

17616 APTIC NO. 35875

Jenkins, I.

DECREASE IN THE FREQUENCY OF FOG IN CENTRAL LONDON. *Meteorol. Mag. (London), 100(1192):317-322, Nov. 1971. 5 refs.*

Numbers of occasions with visibilities below 500, 200, and 100 at London Weather Center were extracted for each of the observations at 00, 03, 06, 09, 12, 15, 18, and 21 Greenwich meantime during the period July 1948 to June 1970. At 09, 12, and 15 GMT, the number of occasions of visibility less than 500 decreased steadily throughout the period of the study but at 00, 03, and 06 GMT the number increased in the middle and late 1950s and only decreased in the 1960s. The ratio of the number of occasions at 06 to the number at 09 increased through unity during the period. These changes maybe connected with changes in smoke emission in central London, though not specifically with the consequences of the Clean Air Act of 1956. (Author summary modified)

17617 APTIC NO. 35493

Jones, I. T. N. and K. D. Bayes

ENERGY TRANSFER FROM ELECTRONICALLY EXCITED N 2. *Chem. Phys. Letters (Amsterdam), 11(2):163-166, Oct. 1, 1971. 11 refs.*

Photoionization studies showed that singlet excited oxygen O2 a1 delta) is formed by energy transfer from electronically excited nitrogen dioxide. The efficiency of this energy transfer process is sufficient to make it a major source of singlet molecular oxygen in polluted urgan atmospheres. However, electronically excited NO2 produced by different wavelengths is not equally efficient for singlet excited oxygen production. That produced by wavelengths near 400 nm is approximately three times more efficient than that produced at 600 nm. Typical urban concentrations of singlet excited oxygen will result in a small but significant contribution to oxidation reactions in smog. (Author abstract modified)

17618 APTIC NO. 35812

Junge, C. and R. Jaenicke

NEW RESULTS IN BACKGROUND AEROSOLS STUDIES FROM THE ATLANTIC EXPEDITION OF THE R. V. METEOR, SPRING 1969. *J. Aerosol Sci., 2(3):305-314, Aug. 1971. 13 refs.*

Long-term variations in background aerosols, defined as the aerosols which are affected only slightly by anthropogenic activities and are far away from local natural sources, can change cloud formation and the global radiation budget. To improve the knowledge of these aerosols, measurements of the aerosol size distribution were performed on the Atlantic Expedition of the R. V. Meteor. A rotating-impactor covering the size range from 20 to 100 microns radius and a specially developed single stage nozzle impactor for particles 3 to 30 microns in radius were used as well as a microscope technique and a set of five double stage impactors. An optical particle counter was used for the 0.3 to 3 micron radius size range, and a specially developed photographic condensation nuclei counter was used for size distribution measurements below 0.1 micron. The total number concentration showed an average around 600/cu m, twice as high as expected for background aerosol. The mean aerosol distribution indicated a concentration maximum around 0.001 micron radius, supporting the idea of a dynamic equilibrium in the size distribution. Besides a relative maximum around 0.3 micron, the distribution showed a smooth shape between 0.3 and 100 microns. Air masses from the Sahara desert observed in mid Atlantic showed a concentration increase between 0.1 and 10 microns. (Author abstract modified)

17619 APTIC NO. 35700

Kazarian, Raphael A., A. S. Gurvich, Rolan G. Manucharian, and Edward S. Vartanian

MEASUREMENT OF THE AVERAGE STRUCTURAL CHARACTERISTIC OF THE ATMOSPHERIC REFRACTIVE INDEX. *Proc. IEEE (Inst. Elec. Electron. Engrs.), 58(10):1546-1547, Oct. 1970. 2 refs.*

The turbulence-induced fluctuations of the refractive index play an important role in many problems related to the propagation of light (in particular laser radiation) through the atmosphere. Measurements of the square of the structure constant of the atmospheric refractive index averaged over a 25-km propagation path are presented, and the daily behavior of the square of the structure constant of the refractive index for four days in July 1969, are shown. The measurements were made with a single mode helium-neon laser which radiates about 40 mW of power with a beam divergence of about two minutes of arc. (Author abstract modified)

17620 APTIC NO. 35617

Keeling, Charles D.

IS CARBON DIOXIDE FROM FOSSIL FUEL CHANGING MAN S ENVIRONMENT? Proc. Am. Phil. Soc., 114(1):10-17, Feb. 1970. 17 refs. (Presented at the American Philosophical Society Symposium on Atmospheric Pollution: Its Long-term Implications, April 25, 1969.)

The annual input to the atmosphere of carbon dioxide from fossil fuels can be estimated within an accuracy of about 20% from records of the production of coal, petroleum, and the other fossil fuels. The increase in atmospheric CO2 has been monitored since 1957 at two remote stations Mauna Loa, Hawaii, and the South Pole to find what proportion of CO2 from fossil fuel is accumulation in the atmosphere. Over a year, both stations show a cyclic pattern owing to seasonal variation in plant activity. A surprising feature of the Mauna Loa record was the apparent falling off of the slope of the trend during a period when the rate of CO2 input was increasing. Also surprising was the result of a calculation of the behavior of surface ocean water based on the simple but realistic assumption that CO2 is entering the oceans at a rate proportional to the CO2 partial pressure difference produced at the sea surface. These features suggest that the surface layer of ocean water has not been the principal agent for removing fossil fuel CO2 from the air, at least during the past few years. The possible climatic response to an increase in atmospheric CO2 is discussed. If all the CO2 were to vanish from the atmosphere, the surface temperature of the earth would be reduced substantially.

17621 APTIC NO. 35781

Khrgian, A. Kh. and B. Lamzhavyn

VARIATIONS OF ATMOSPHERIC OZONE IN UPPER-AIR PRESSURE FORMATIONS. *(Izmeneniya atmosfernogo ozona v vysotnykh baricheskikh obrazovaniyakh). Text in Russian. Meteorol. i Gidrol., no. 9:24-29, 1971. 3 refs.*

The distribution of atmospheric ozone pressure in high cyclones, anticyclones, troughs, and ridges at 100, 50, and 20 mb levels was determined from ozonesonde data obtained over North America during 1963-1964. The results show a significant growth of ozone pressure in cyclones at the 100 mb level, especially in the western part of a cyclone. This growth indicates the effect of advection as well as the general downward air motion. There was a general decrease of pressure in anticyclones and also ozone changes in troughs and ridges. These distinctions are being smoothed due to the prevailing effect of photochemical processes versus dynamic ones.

17622 APTIC NO. 35562

Laktionov, A. G. and Yu. S. Sedunov

ON THE DEPENDENCE OF MAXIMUM SUPERSATURATIONS AND THE CONCENTRATION OF DROPLETS FORMED IN A RISING AIR CURRENT ON THE SPECTRUM OF CLOUD NUCLEI. *Tr. Inst. Eksp. Meteorol., no. 6:10-15, 1969. 8 refs. Translated from Russian by C. Long, National Lending Library for Science and Technology (England), 6p.*

An equation was derived that describes maximum supersaturations and concentrations of droplets formed in a rising air current and their dependence on the spectrum of cloud nuclei. The equation and nuclei supersaturation spectra obtained by various authors were used to calculate values for droplets formed in air ascending at one to 100 cm/sec. Maximum supersaturations obtained in the atmosphere are between .01 and 0.001. Maximum droplet formation varies from a few particles/cu cm to 500 particles cu cm. The equation covers a wider range of temperatures and pressures than the Twomey formula.

17623 APTIC NO. 35841

Lawrence, E. N.

URBAN CLIMATE AND DAY OF THE WEEK. *Atmos. Environ., 5(11):935-948, 1971. 50 refs.*

Based on a survey of research on the day-of-the-week variation in a number of weather parameters, with special reference to rainfall amount, physical models for thermal convection and air pollution, wind speed, and topography were constructed. Analysis suggested that the amplitude of the weekly rainfall cycle in the London area was related to wind speed, sunshine duration, and the magnitude of the urban heat island. The mean daily maximum temperature in Central London and the surrounding rural area in midsummer differed on a weekly cycle. The mean weekly amplitude of the difference was approximately 0.5 C; the lowest mean difference occurred on Thursday and the highest occurred on Sunday. The pattern is significant at the 0.1% level; weekly amplitude varied inversely with wind speed. (Author abstract modified)

17624 APTIC NO. 35524

Lhermitte, Roger M.

MEASUREMENT OF WIND AND WIND FIELD BY MICROWAVE DOPPLER RADAR TECHNIQUES. *Atmos. Environ., 5(8):691-702, Aug. 1971. 16 refs. (Presented at the Symposium on Advances in Instrumentation for Air Pollution Control, Cincinnati, Ohio, May 26-28, 1969.)*

Microwave Doppler radar techniques are widely applied to the study of the wind field during precipitation conditions by using precipitation particles as tracers for air motion. In the case of clear atmospheres, the presence and reliability of natural targets detectable by microwave radars is questionable and man-made targets are used as air motion tracers. Targets designed for this purpose have low inertia, small terminal speed, and can be dispersed in large quantities (chaff). Microwave Doppler radar technqies applicable to studying clear air motion -- and its time variability -- in three dimensions by release of chaff targets are surveyed. The capability of the Doppler method is drastically improved by using two Doppler radars, installed at different locations, and simultaneously observing the same region where air motion tracers are released. This technique should lead to three-dimensional observation of well-organized features of the wind field, such as local convergence or vorticity, as well as their relation to the small-scale wind variability.

17625 APTIC NO. 35073

Lumley, J. L.

EXPLANATION OF THERMAL PLUME GROWTH RATES. *Phys. Fluids, 19(11):2537-2538, Nov. 1971. 7 refs.*

In axisymmetric thermal plumes the tendency of the entrainment strain rate to compress the large eddies horizontally is balanced by the tendency of the stable vertical temperature distribution near the edge to compress the large eddies vertically, producing wake-like values of the Reynolds number. (Author abstract)

17626 APTIC NO. 35473

MacDonald, Gordon J. F.

THE MODIFICATION OF PLANET EARTH BY MAN. *Tech. Rev., 1969:27-35, Oct./Nov. 1969.*

The possibility that inadvertent effects of human activities could lead to catastrophic changes in the physical environment within a few decades unless these changes are understood and ways are developed to compensate for and avert the undesired effects is discussed. Ways in which the atmospheric heat balance and the climate could be changed include increasing the carbon dioxide content of the atmosphere by burning fossil fuels; decreasing atmospheric transparency of aerosols; decreasing atmospheric transparency by dust put into the atmosphere as a result of improper agricultural practices; and altering the rate of transfer of thermal energy and momentum between the oceans and atmosphere by an oil film resulting from incompete combustion and oil spill from ocean-going vessels. The decreasing temperature of the past two decades cannot be attributed to CO2, since its concentration continues to increase while the temperatures decrease; there is some evidence that urban and industrial pollution, possibly aided by agricultural pollution, is largely responsible. Particle pollution can affect the thermal balance. The net effect on the total radiation balance depends upon the abundance, size, distribution, and altitude range of the small particles. The indirect particle effect of encouraging the formation of low clouds and fog further enhances modification of the thermal balance. Man-made earthquakes are also discussed.

17627 APTIC NO. 35846

Macey, H. H.

TECHNICAL NOTE. BOSANQUET S PLUME RISE FORMULA AND THE T.V.A. DATA. *Atmos. Environ., 4(5):577-583, Sept. 1970. 3 refs.*

The Bosanquet equation shows good agreement with the large power station single stack plume rise data of the Tennessee Valley Authority at wind speeds greater than 4.0m/sec or 5.0m/sec. It gives plume rises higher than observed at low wind speeds. The same conclusion is reached with twin stacks when their emissions are combined and treated as one. Agreement is greatly increased over the whole range of wind speeds by substituting 150 sec for the term t-sub one in the Bosanquet formula instead of the normal 200 sec. (Author conclusions modified)

17628 APTIC NO. 35708

Makhatokin, L. G.

ATMOSPHERIC TURBIDITY CHARACTERISTIC AS A CONSEQUENCE OF GENERAL STATISTICAL REGULARITIES. *Aktinometriya Opt. Atmos., Tr. Mezhvedom. Soveshch., 7th, Leningrad, 1968, p. 284-287. 18 refs. (May 27-31.) Translated from Russian by Louise Heenan, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 5p., Nov. 25, 1970.*

NTIS, DDC: AD 720364

Atmospheric characteristics (transparency factor and turbidity factor) commonly used in actinometry have no specific physical meaning for integral flows of solar radiation. Moreover, the erroneous Linke definition of the turbidity factor is still widely accepted. The actual characteristics of atmospheric turbidity are discussed with reference to use of the N number and statistical regularities. Use of the micron spectrum, which represents the total itensity of solar radiation for each value of the atmospheric extinction factor micron is proposed for determining the N number.

17629 APTIC NO. 35939

Makino, K. and K. Iinoya

AEROSOL DIFFUSION. *(Emmutain no kakusan). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 9(5):12-17. Dec. 1971. 4 refs.*

The pattern of aerosol diffusion is based on the individual particle s random Brownian motion. The basic mathematical formula of the primary random walk, the more complex pattern of random movement with the reflection wall or absorption wall, and several known formulas on smoke dispersion patterns are analyzed and discussed. Formular for an instantaneous emission source, point emission source, continuous localized emission source, and line emission source are analyzed and explained. A plume behavior model of a localized emission source is given by a diagram.

17630 APTIC NO. 35829

Mammarella, L.

APPLICATION OF METEOROLOGICAL TRACERS FOR THE EXPERIMENTAL DETERMINATION OF AIR POLLUTANT DIFFUSION. *(L impiego dei traccianti meteorological per l accertamento spermentale della diffusione di inquinamenti atmosferici). Text in Italian. Nuovi Ann. Igiene Microbiol. (Rome), vol. 20:461-474, Sept.-Oct. 1969. 23 refs.*

A fluorescence technique has been applied to a meteorological tracer study utilizing uranine (sodium salt of fluorescin). Filters containing drops or solid nuclei of uranine are humidified by contact with Millipore membrane filters moistened with distilled water. In this way, the water vapor absorbed by the uranine nuclei is not sufficient to dissolve the uranine but is sufficient to cause the nuclei to recover their characteristic green fluorescence. Tracer studies with uranine require a smaller volume of air to be sampled than other techniques. (Author summary modified)

17631 APTIC NO. 35561

Marchgraber, Reinhold M.

THE DEVELOPMENT OF STANDARD INSTRUMENTS FOR RADIATION MEASUREMENTS. *Meteorol. Monogr., 11(33):302-314, Oct. 1970. 27 refs.*

The development of instruments for the measurement of solar radiation fluxes is reviewed with emphasis on instruments for use as primary or secondary standards for meteorological radiation measurements. The fundamental principles of radiometric instruments and their historical evolution are discussed. Calorimetric techniques are most suited for precision measurements because of their basic independence of the spectral characteristics of the fluxes to be measured. A first-order model of the caloric radiometer was used to demonstrate gets detectable by microwave radars is questionable and man-made targets are used as air motion tracers. Targets designed for this purpose have low inertia, small terminal speed, and can be dispersed in large quantities (chaff). Microwave Dopper radar technqies applicable to studying clear air motion -- and its time variability -- in three dimensions by release of chaff targets are surveyed. The capability of the Doppler method is drastically improved by using two Doppler radars, installed at different locations, and simultaneously observing the same region where air motion tracers are released. This technique should lead to three-dimensional observation of well-organized features of the wind field, such as local convergence or vorticity, as well as their relation to the small-scale wind variability.

17625 APTIC NO. 35073

Lumley, J. L.

EXPLANATION OF THERMAL PLUME GROWTH RATES. *Phys. Fluids, 19(11):2537-2538, Nov. 1971. 7 refs.*

In axisymmetric thermal plumes the tendency of the entrainment strain rate to compress the large eddies horizontally is balanced by the tendency of the stable vertical temperature distribution near the edge to compress the large eddies vertically, producing wake-like values of the Reynolds number. (Author abstract)

17626 APTIC NO. 35473

MacDonald, Gordon J. F.

THE MODIFICATION OF PLANET EARTH BY MAN. *Tech. Rev., 1969:27-35, Oct./Nov. 1969.*

The possibility that inadvertent effects of human activities could lead to catastrophic changes in the physical environment within a few decades unless these changes are understood and ways are developed to compensate for and avert the undesired effects is discussed. Ways in which the atmospheric heat balance and the climate could be changed include increasing the carbon dioxide content of the atmosphere by burning fossil fuels; decreasing atmospheric transparency of aerosols; decreasing atmospheric transparency by dust put into the atmosphere as a result of improper agricultural practices; and altering the rate of transfer of thermal energy and momentum between the oceans and atmosphere by an oil film resulting from incompete combustion and oil spill from ocean-going vessels. The decreasing temperature of the past two decades cannot be attributed to CO2, since its concentration continues to increase while the temperatures decrease; there is some evidence that urban and industrial pollution, possibly aided by agricultural pollution, is largely responsible. Particle pollution can affect the thermal balance. The net effect on the total radiation balance depends upon the abundance, size, distribution, and altitude range of the small particles. The indirect particle effect of encouraging the formation of low clouds and fog further enhances modification of the thermal balance. Man-made earthquakes are also discussed.

17627 APTIC NO. 35846

Macey, H. H.

TECHNICAL NOTE. BOSANQUET'S PLUME RISE FORMULA AND THE T.V.A. DATA. *Atmos. Environ., 4(5):577-583, Sept. 1970. 3 refs.*

The Bosanquet equation shows good agreement with the large power station single stack plume rise data of the Tennessee Valley Authority at wind speeds greater than 4.0m/sec or 5.0m/sec. It gives plume rises higher than observed at low wind speeds. The same conclusion is reached with twin stacks when their emissions are combined and treated as one. Agreement is greatly increased over the whole range of wind speeds by substituting 150 sec for the term t-sub one in the Bosanquet formula instead of the normal 200 sec. (Author conclusions modified)

17628 APTIC NO. 35708

Makhotokin, L. G.

ATMOSPHERIC TURBIDITY CHARACTERISTIC AS A CONSEQUENCE OF GENERAL STATISTICAL REGULARITIES. *Aktinometriya Opt. Atmos., Tr. Mezhvedom. Soveshch., 7th, Leningrad, 1968, p. 284-287. 18 refs. (May 27-31.) Translated from Russian by Louise Heenan, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 5p., Nov. 25, 1970.*

NTIS, DDC: AD 720364

Atmospheric characteristics (transparency factor and turbidity factor) commonly used in actinometry have no specific physical meaning for integral flows of solar radiation. Moreover, the erroneous Linke definition of the turbidity factor is still widely accepted. The actual characteristics of atmospheric turbidity are discussed with reference to use of the N number and statistical regularities. Use of the micron spectrum, which represents the total itensity of solar radiation for each value of the atmospheric extinction factor micron is proposed for determining the N number.

17629 APTIC NO. 35939

Makino, K. and K. Iinoya

AEROSOL DIFFUSION. *(Emmutain no kakusan). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 9(5):12-17. Dec. 1971. 4 refs.*

The pattern of aerosol diffusion is based on the individual particle's random Brownian motion. The basic mathematical formula of the primary random walk, the more complex pattern of random movement with the reflection wall or absorption wall, and several known formulas on smoke dispersion patterns are analyzed and discussed. Formular for an instantaneous emission source, point emission source, continuous localized emission source, and line emission source are analyzed and explained. A plume behavior model of a localized emission source is given by a diagram.

17630 APTIC NO. 35829

Mammarella, L.

APPLICATION OF METEOROLOGICAL TRACERS FOR THE EXPERIMENTAL DETERMINATION OF AIR POLLUTANT DIFFUSION. *(L impiego dei traccianti meteorological per l accertamento spermentale della diffusione di inquinamenti atmosferici). Text in Italian. Nuovi Ann. Igiene Microbiol. (Rome), vol. 20:461-474, Sept.-Oct. 1969. 23 refs.*

A fluorescence technique has been applied to a meteorological tracer study utilizing uranine (sodium salt of fluorescin). Filters containing drops or solid nuclei of uranine are humidified by contact with Millipore membrane filters moistened with distilled water. In this way, the water vapor absorbed by the uranine nuclei is not sufficient to dissolve the uranine but is sufficient to cause the nuclei to recover their characteristic green fluorescence. Tracer studies with uranine require a smaller volume of air to be sampled than other techniques. (Author summary modified)

17631 APTIC NO. 35561

Marchgraber, Reinhold M.

THE DEVELOPMENT OF STANDARD INSTRUMENTS FOR RADIATION MEASUREMENTS. *Meteorol. Monogr., 11(33):302-314, Oct. 1970. 27 refs.*

The development of instruments for the measurement of solar radiation fluxes is reviewed with emphasis on instruments for use as primary or secondary standards for meteorological radiation measurements. The fundamental principles of radiometric instruments and their historical evolution are discussed. Calorimetric techniques are most suited for precision measurements because of their basic independence of the spectral characteristics of the fluxes to be measured. A first-order model of the caloric radiometer was used to demonstrate operating procedures. Possible improvements and trends of development in modern radiometers are examined. (Author abstract modified)

17632 APTIC NO. 35870

Meyer, Edwin L., Jr.

EFFECTS OF EMISSION CHARACTERISTICS ON AIR QUALITY DURING SIMULATED AIR POLLUTION EPISODES. *Atmos. Environ., 5(11):973-984, 1971. 12 refs.*

An air pollution dispersion model was used to correlate air quality measured in terms of sulfur dioxide concentration in a hypothetical city with the emission characteristics for SO2. Emission characteristics examined included configuration of sources, diurnal emission rate schedules, total emission rates, and the combination of point and area sources. Air quality was improved significantly by selecting configurations whose major sources were too far apart to jointly contaminate a locality. Altering diurnal schedules of emission rates to take advantage of diurnal variations in atmospheric dilutive capacity improved air quality by as much as 23%. The set of priorities given to emission rate reductions of different types of sources was an important determinant of air quality improvement attained with a given reduction in the total emission rate. Pollutant concentration at a receptor location was primarily the result of emissions on contiguous locations. Longer time lags between emission rate reductions and air quality improvement during episodes placed a premium on controls which could be implemented quickly. The results provided insight into the potential use of the model for air quality management and pollution abatement. The model was verified using actual emission data and predicted concentrations were within a factor of 1.4 of observed concentrations. (Author abstract modified)

17633 APTIC NO. 35928

Mullen, Ruth E., Dennis A. Darby, and David L. Clark

SIGNIFICANCE OF ATMOSPHERIC DUST AND ICE RAFTING FOR ARCTIC OCEAN SEDIMENT. *Geol Soc. Amer. Bull., vol. 83:205-211, Jan. 1972. 10 refs.*

Two sedimentation processes active in the Arctic Ocean are examined: atmospheric dust deposition and deposition of ice-rafted material. Dust deposition may contribute 10% or more of the sediment, with a 30% or more contribution from ice-rafted debris. The clay mineralogy of the modern atmospheric dust is approximately 40% illite with almost equal amounts of chlorite and kaolinite. Dust fall and transport are also discussed.

17634 APTIC NO. 35644

Myers, Joel N.

FOG. *Sci. Am., 219(6):74-82, Dec. 1968.*

Types of fogs, their effects and methods of dispersal are discussed. The principal source of toxicity in most pathological smogs appears to be sulfur dioxide from the smokestacks. Smogs of Los Angeles are misnamed, as they frequently consist of a haze of pollutants that are trapped by an inversion layer of dry air rather than by a fog. The long-term effects of urban smogs may include chronic bronchitis, emphysema, asthma, and lung cancer. Smog also reduces sunlight, lowers daytime temperature and wind speed, raises humidity and is even suspected of causing a decrease in rainfall. To prevent fog, factories giving rise to air pollution should be located at sites where the topography and prevailing winds favor effective dispersal of the pollutants. One of the most promising of numerous artificial dispersion methods is the injection of a catalyst or other agent that will cause the droplets to coalesce and thus grow large enough to fall quickly to the ground.

17635 APTIC NO. 35482

Nickola, P. W., J. D. Ludwick, and J. V. Ramsdell, Jr.

ATMOSPHERIC TRACER TECHNIQUE EMPLOYING KR 85 AND USE OF THIS TECHNIQUE IN DEFINING PUFF DIMENSIONS AND TRANSPORT SPEED. *Isotope Radiat. Technol., 9(1):65-71, Fall 1971. 9 refs.*

A krypton isotope (Kr85) was released and subsequently monitored on a real-time basis at field stations at distances up to 800 m from the release point and at elevations of up to 21 m. The tracer procedure includes both instantaneous (puff) and continuous (plume) release techniques. The effective transport height of puffs released at ground level increased with distance but increased least in a stable atmosphere. In a stable atmosphere, the growth rate of a puff in the downwind direction continued to be greater than the growth rate in the crosswind direction as the puff travelled from 200 to 800 m from the release point. In less stable atmospheres, puffs become more symmetrical in shape as they moved from 200 to 800 m. Field system and data handling techniques are discussed. (Author abstract modified)

17636 APTIC NO. 35745

Nomura, Yasumasa

EXPERIMENTAL STUDIES ON SMOKE HEIGHT OF STACK GASES. *(Entotsu kara deru kemuri no takasa ni kansuru jikkenteki kenkyu). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokai Branch, p. 17-19, 1971. (Presented at the Japan Society of Mechanical Engineers, Tokai-Branch s Founding Commemorative Lectures, Gifu, Japan, Nov. 12, 1971.)*

Experiments were conducted to determine the maximum smoke height in wind. In a closed room, a cart carrying a stack was moved on rails, while the stack emitted ammonia gas. Three nets made of cotton threads soaked in bromthymol blue solution were installed on the cart 40 cm apart from each other, and the change of the yellow color to blue was observed. The speed of the gas emission was varied and the speed ratio was changed; reliability was confirmed by repetition. The height of smoke varied depending on factors such as emission velocity, wind velocity, the horizontal distance from the center of the stack to the specific location, the diameter of the stack, gravity acceleration, density of ammonia gas and the air, and the viscosity indices of the gas and the air. Formulas for the height and the maximum height of dispersion were presented.

17637 APTIC NO. 35610

Ory, Hal A. and Forrest R. Gilmore

POSSIBLE EFFECTS OF ATMOSPHERIC PARTICLES ON FIREBALL EMISSIONS. *Rand Corp., Santa Monica, Calif., Defense Atomic Support Agency Contract DASA01-71-C-0012, Proj. NWER-XAXD, Task B001, Rept. R-669-DASA, DASA-2612, 17p., Feb. 1971. 7 refs.*

NTIS, DDC: AD 722031

In order to investigate the possible effects of natural atmospheric particles on fireball emissions from nuclear weapons, data on particle distribution in the atmosphere are used to calculate the mass fraction as a function of altitude for sulfate particles and particles of meteoritic origin. Above 20 km, the mass fraction decreases rapidly with altitude. The mass fraction of sulfur dioxide vapor is probably more than an order of magnitude greater, based on observations at low altitudes. The meteoritic mass fraction shows practically no altitude dependence. Based on a thermodynamic model, the mass of meteoritic material vaporized in a fireball is less than half a pound per megaton of bomb yield. The contribution of sulfate and meteoritic particles is, therefore, relatively negligible. (Author summary modified)

17638 APTIC NO. 35624

Owens, James C.

OPTICAL DOPPLER MEASUREMENT OF MICROSCALE WIND VELOCITY. *Proc. IEEE Inst. Elec. Electron. Engrs., vol 57:530-536, April 1969. 19 refs.*

A system analysis of the feasibility of optical heterodyne measurement of Doppler shifts as a method for the remote determination of vector wind velocity was carried out. With a 50-mW laser at 6328 A, naturally occurring aerosols in clear air will permit measurements at distances on only a few tens of centimeters, but haze and dust will extend this range to a few tens of meters and fog to 75 m. By generating smoke to enhance the scatter, a range of about 40 m will be possible. The use of a 1-watt argon laser will extend the clear-air and smoke-plume ranges by a factor of 48 and the ranges in uniform dusts or fog by smaller amounts. Thus, useful measurements in the boundary layer of the atmosphere are possible although they will require some artifical contamination of the air to give consistently good results. Remote temperature measurement is not possible using this technique. (Author abstract modified) 0

17639 APTIC NO. 35414

Pasquill, F.

THE ESTIMATION OF THE DISPERSION OF WINDBORNE MATERIAL. *Meteorol. Mag. (London), 90(1063):33-49, Feb. 1961. 11 refs.*

The Sutton formulae for surface and elevated sources are generally used to calculate the atmospheric dispersion of windborne gaseous or finely divided particulate material. The formulae are reliable for specifying the average distribution, over a few hundred meters, downwind of a source operating for a few minutes on level, unobstructed terrain, with a steady wind direction and neutral stability. Extension to other circumstances depends on empirical and often speculative adjustments of the diffusion parameters. Recent theoretical and experimental work indicate that a fairly rational allowance can be made for the effects of much of the wide variations in atmospheric turbulence. These recent developments, which are reviewed, form the basis of a tentative system for estimating diffusion in a wide range of meteorological conditions and over distances up to 100 km. The basic assumption is that of a Gaussian crosswind and vertical distribution in a plume or cloud of windborne material. Details of the system are given in two appendices, the first providing complete instructions for calculations, the second presenting an example.

17640 APTIC NO. 35618

Probald, Ferenc

DIURNAL VARIATION OF THE TEMPERATURE DIFFERENCES BETWEEN DOWNTOWN AND SUBURBAN STATIONS IN BUDAPEST. *Magyar Met. Tars. Foly., Ikoj. (Budapest), 1969:49-53. 5 refs. Translated from Hungarian by E. Semere. 7p.*

Thermographic recordings were collected from downtown and suburban stations in Budapest to determine diurnal variations of temperature difference. The downtown-suburban temperature difference for the year was more important in the nocturnal radiation period; the amplitude of diurnal variation was greater in the summer and in clear weather. In the winter, the city area was warmer than its environs during the entire day. The temperature difference was higher in the winter even when computed from real daily average temperatures rather than from average values of observations for given hours. (Author abstract modified)

17641 APTIC NO. 35458

Proffitt, Thomas O.

VARIATIONS IN DAILY SOLAR RADIATION AT NATIONAL WEATHER SERVICE OBSERVING SITES IN TEXAS. *Texas Univ., Austin, Atmospheric Science Group, National Science Foundation Grant GA-16822, Rept. 27, 38p., Feb. 1971. 11 refs.*

Routine National Weather Service radiation data for five Texas cities over 15-18 years were analyzed, and evidence of an intra-weekly cycline in air pollution in the urban environment was found. Daily means taken over the entire range of data showed a minimum in solar radiation attenuation on Sundays at four of the five stations studied. At all stations there was a tendency for a mid-week maximum in attentuation. Attenuation studies for winter months showed more conclusive results since meteorological conditions are more favorable for the observation of air pollutants. The difference in attenuation between the Sunday minimum and the mid-week maximum in winter months ranged from eight percent at El Paso to 26% at Fort Worth. Chi-square insignificance tests verified the significance of a Sunday minimum and mid-week maximum in attention at the 90% level at least at both El Paso and Fort Worth. (Author conclusions modified)

17642 APTIC NO. 35084

Quinio, R. Le and J. Hugon

RESULTS OF FULL SCALE ATMOSPHERIC DIFFUSION EXPERIMENTS. *(Resultats d experiences de diffusion atmospherique en vraie grandeur). Text in French. Pollut. Radioact. Milieux Gazeux, Proc. Symp., Saclay, France, 1963. p. 141-148. 4 refs. (Nov. 12-16.)*

Atmospheric diffusion measurements were performed at six different sites in France during 1962 and 1963. Preliminary results reveal a better dispersion than expected, which seems to be caused in part by the time of sampling (from one-half to one hour) and in part by the uneven nature of the sites. Several deposition rates and washout coefficients were determined, confirming previous results but cancelling the notion of a possible maximum deposition calculation. (Author abstract modified)

17643 APTIC NO. 35371

Reitan, Clayton Harold

AN ASSESSMENT OF THE ROLE OF VOLCANIC DUST IN DETERMINING MODERN CHANGES IN THE TEMPERATURE OF THE NORTHERN HEMISPHERE. *Wisconsin Univ., Madison, Dept. of Meteorology, Thesis (Ph.D.), 1971, 147p. 69 refs.*

The mean temperature of the Northern Hemisphere was determined for the period 1955 through 1968. The downard trend which began about 1940 continued, though interrupted, into the 1960 s. An analysis of the relationship between atmospheric dustiness and the energy changes or energy imbalance necessary to have produced the temperature trends since 1880 indicated that volcanic dust may well have been the most important factor producing hemispheric temperature variations observed in the past nearly 100 years. The next step was to develop a relationship which could be used to estimate the sensitivity of the temperature of the hemisphere to changes in solar radiation into the earth-atmosphere system caused by changes in the transmissivity of the atmosphere. This relationship, called the response ratio, made it possible to analyze changes in temperature and radiation following the volcanic eruption of Agung in 1963. The temperature decline during 1964 and 1965 could be reasonably attributed to the observed change in atmospheric transmissivity caused by the dust. In addition, the decreasing temperature since 1940 also seemed explainable in terms of a gradually decreasing atmospheric transmissivity. (Author abstract modified)

17644 APTIC NO. 35368

Riehl, Herbert and Dirk Herkhof

LARIMER COUNTY, COLORADO, AIR POLLUTION AND OUTLOOK. *Colorado State Univ., Fort Collins, Dept. of Atmospheric Science, 43p., Dec. 1970. 14 refs.*

Planning for economic and population growth in presently rural areas would be considerably aided from the standpoint of air quality, if an assessment of future air pollution in terms of expected population growth, as a parameter, could be made. Such an estimate has been attempted for the foothills areas just east of the Colorado Rockies near the northern border of the state. At first, pollution potential, defined as the probability of incidence of air pollution episodes of some minumum duration, was calculated from winds obtained during a field experiment. On the average, 10 episodes perwinter taking up one quarter of a winter period may be expected. Next, the mechanisms of present air pollution accumulation and depletion were studied preliminary to developing daytime and nighttime models for future pollution. A nighttime model without turbulence can reconstruct the present pollution map quite faithfully, whereas turbulent upward flux must be added in daytime, not unexpectedly. In the models, it is possible to express future pollution density in terms of wind speed and pollution source strength. Assuming a rate of 50% population increase per decade, estimates of average pollution and also of pollution distrubution are prepared until the year 2000. (Author abstract modified)

17645 APTIC NO. 35204

Rinehart, Gayle S.

EVIDENCE FOR SULFATE AS A MAJOR CONDENSATION NUCLEUS CONSTITUENT IN NONURBAN FOG. *White Sands Missile Range, New Mex., Atmospheric Sciences Lab., DA Task 1TO61102B53A-20, Army Electronics Command TR-ECOM-5366, OSD-1366, 14p., March 1971. 377 refs.*

NTIS, DDC: AD 724610

Data on the cloud condensation nucleus constituency in remote areas were obtained by analyzing particulte samples from the White Sands Missile Range, New Mexico, area. Sampling with 71 Anderson samplers was carried out from September to December 1969. The Royco light-scattering counter was employed simultaneously during a portion of the sampling period. Sulfates accounted for most of the soluble particles, and thus the potential condensation nuclei. Moisture increased the number of large sulfate particles; strong wind speeds reduced the number. In general, the number of large and giant particles remained constant through the day. Fluctuations in their numbers were caused by rain washout or incursions of foreign air masses. The results indicate that the sulfate ion is sufficiently abundant in nonurban areas to be a dominant constituent in cloud and fog condensation nuclei.

17646 APTIC NO. 35282

Roy, A. K.

NUCLEUS RICHNESS OF CLOUD AIR AND RAINABILITY OF CLOUDS. *Indian J. Meteorol. Geophysics, 21(2):231-236, April 1970. 3 refs.*

Considered theoretically, convective clouds formed in highly polluted air which is over-rich in condensation nuclei are less liable to precipitate than similar clouds forming in normally clean air. Data relating to squall occurrences in the Calcutta area and associated rainfall during a period of five pre-monsoon seasons provide a reasonably good support to the view that nucleus richness of air is a factor which affects adversely the precipitation behavior of clouds, particularly clouds of the convective type. (Author abstract modified)

17647 APTIC NO. 36000

Schlegel, K.

PHOTOIONIZATION YIELDS OF 0, 02 AND N2 FOR HIGH AND LOW SOLAR ACTIVITY. *J. Atmospheric Terrest. Phys., 33(12):1923-1931, Dec. 1971. 15 refs.*

Photoionization yields of atomic oxygen, molecular oxygen, and molecular nitrogen were calculated with the help of a Monte-Carlo simulation of a model ionosphere. In this model the magnetic field, the influence of coulomb scattering, and various excitation and ionization processes were taken into account. The photoionization yields depending on altitude, photon wavelength, and solar activity were expressed in a simple analytical form for easy use in calculations. (Author abstract)

17648 APTIC NO. 35991

Shiozawa, Kiyoshige, Atsushi Ootaki, and Shin-chi Okamoto

A STUDY ON THE RELATION BETWEEN AIR POLLUTANTS CONCENTRATION AND AIR PRESSURE DISTRIBUTIONS. *(Taiki osen busshitsu nodo to kiatsu haichi no kankei). Text in Japanese. Waseda Daigaku Rikogaku Kenkyusho Hokoku Bull. Sci. Eng. Res. Lab., Waseda Univ., no. 53:131-138, 1971. 6 refs.*

By a method of principal component analysis based on correlations between five air pollutants (dust, sulfur dioxide, carbon monoxide, nitric oxide, and nitrogen dioxide), an air pollution index was calculated and a relation was obtained between air pollutant concentration and air pressure distributions. In winter, air pollutant concentrations gradually increase when an anticyclonic movement is followed by a cyclone passing over Japan.

17649 APTIC NO. 35856

Sidebottom, Howard W., Charles C. Badcock, George E. Jackson, Jack G. Calvert, George W. Reinhardt, and Edward K. Damon

PHOTOOXIDATION OF SULFUR DIOXIDE. *Environ. Sci. Technol., 6(1):72-79, Jan. 1972. 49 refs.*

Rate constants for the quenching of excited triplet sulfur dioxide molecules with the atmospheric gases were determined to delineate the mechanism of SO2 photooxidation in the atmosphere. Quenching efficiencies of nitrogen, oxygen, water, argon, helium, xenon, carbon monoxide, carbon dioxide, nitric oxide, ozone, methane, propane, propylene, and butene were calculated. Rate and absorption data for SO2 were used to estimate the maximum rate of homogeneous photooxidation; at a solar zenith angle of 20 degrees and 50% relative humidity, the theoretical maximum rate was 1.9% per hour. (Author abstract modified)

17650 APTIC NO. 35565

Sigal, I. A. and N. A. Gurevich

ESTIMATE OF THE INFLUENCE OF VARIOUS GAS EJECTION SOURCES ON POLLUTION IN THE ATMOSPHERE. *Ukr. Khim. Zh., 37(2):140-145, 1971. 16 refs. Translated from Ukrainian by Morris D. Friedman, 6p.*

NTIS: N71-25908

The influence of various gas ejection sources on pollution in the atmosphere is investigated with respect to indices of toxicity, maximum allowable concentrations, and methods of estimation. The fundamental sources of air pollution are the products of fuel combustion (coal, fuel oil, natural gas, and gasoline) as utilized for energy, transport, and heating, e.g., chemical processing, power stations, and automobiles which emit particulate matter (dust or soot), sulfur dioxide, nitrogen oxides (nitrogen dioxide), carbon dioxide, and aldehydes (formaldehyde). Combustion processes, intensity of ejection, and oxidation are examined. These pollutants react in the atmosphere to form toxic compounds. Hydrocarbons can be oxidized to form new, dangerous compounds.

17651 APTIC NO. 35245

Smith, L. P.

FREQUENCIES OF POOR AFTERNOON VISIBILITIES IN ENGLAND AND WALES. *Meteorol. Mag. (London), vol. 90:355-359, 1961.*

Visibility records at 66 stations in England and Wales were examined for the number of occasions per month from 1923-1951 when afternoon visibilities were (1) less than 4400 yards and (2) less than six and a quarter miles. The final results are presented as a seasonal summary. About half the yearly days with afternoon visibilities below 4400 yards occurred in winter, except in the southwest where the proportion was lower. About a quarter of the yearly total occurred in autumn. The summer fraction was small and such days were few in spring at inland stations. Their occurrence on the coast in spring suggests the presence of low cloud or sea fog rather than haze. Mean monthly distributions are also given for six categories of stations: town, country, and four coasts. The values fit a series of fairly smooth curves showing the annual variation.

17652 APTIC NO. 35419

Stockham, John

COOLING TOWER STUDY. (FINAL REPORT). *IIT Research Inst., Chicago, Ill., Technology Center, Air Pollution Control Office Contract CPA 22-69-122, IITRI Proj. C6187, Rept. APTD 0702, IITRI Rept. C6187-3, 123p., Jan. 1971. 10 refs.*

NTIS: PB 201216

A power generating station was examined to evaluate the potential effects of water vapor and heat emissions from natural draft cooling towers on the local environment, climate, and power station emissions. Approximately 10,000 gal/min of water were evaporated and 120 million BTU/min of heat were released at station operation of 80-86% of the rated 1800 MW capacity. Precipitation records were analyzed and established a suggestion of precipitation enhancement as a result of station operation only in July 1969. Cloud initiation during periods of otherwise clear skies was infrequent. However, cooling tower plume often merged with low stratus clouds. The dimensions of the visible portion of the plume were dependent on the temperature and humidity of the ambient air. The plume travelled downwind of the plant with an oscillatory motion in the vertical direction; the motion was due to a plume moisture content 50% in excess of saturation. The mixing of effluents from the power station stacks and the cooling towers was determined by the presence of acid droplets in the visible portion of the cooling tower plume and the sulfur dioxide profiles obtained along the axis of the plume path after the humid plume evaporated. (Author abstract modified)

17653 APTIC NO. 35669

Supatashvili, G. D. and I. T. Klimov

ON THE OCCURRENCE OF SOME HEAVY METALS IN ATMOSPHERIC PRECIPITATIONS ON THE TERRITORY OF GEORGIAN SOVIET REPUBLIC. *(O soderzhanii nekotorykh tyazhelykh metallov v atmosfernykh osadkakh na territorii Gruzinskoy SSR). Text in Russian. Tr. Tbilis. Gos. Univ., vol. 126:167-169, 1968. 7 refs.*

The content of metals in atmospheric precipitation collected in several areas of west Georgia (U.S.S.R.) was studied. Silver, cobalt, molybdenum, tin, titanium, and bismuth were not found. It was concluded that atmospheric precipitation contains the same heavy metals (nickel, vanadium, manganese, copper, aluminum, and iron) as other natural water sources. The order of occurrence of the metals is the same as in the earth's crust. Calculations showed the importance of atmospheric precipitation in the migration of heavy metals. However, a certain amount of the heavy metal in content of precipitation is of local origin participates only locally in the circulation of atmospheric substances.

17654 APTIC NO. 35604

Tebbens, Bernard D., Jerome F. Thomas, and Mitsugi Mukai

FATE OF ARENES INCORPORATED WITH AIRBORNE SOOT. *Am. Ind. Hyg. Assoc. J., 27(5):415-422, Sept.-Oct. 1966. 10 refs.*

The chemical modification of airborne arenes under fluorescent irradiation was studied. Smoke as an experimental source of arenes was diluted, then irradiated in a 22-foot dynamic flow chamber. Samples were collected before and after irradiation and determinstion of concentrations of two arenes, benz(a)pyrene and perylene, and particle sizes were made. Irradiation caused partial modification or disappearance of the arenes by 35 to 65% of the original content. Without irradiation an apparent increase of arenes was noted; however, this was thought to be a function of the system and particle-size factors. The presence of oxygen increases the degree but is not necessary for the modification of arenes. (Author abstract)

17655 APTIC NO. 35264

Ter Haar, Gary L. and Ruth E. Stephens

THE EFFECTS OF AUTOMOBILE EXHAUST PARTICULATES ON VISIBILITY. *Preprint, California Air Resources Board, Sacramento, and California State Dept. of Public Health, 9p., 1971. 13 refs. (Presented at the Conference on Methods in Air Pollution an Industrial Hygiene Studies, 12th, Los Angeles, Calif., April 6-8, 1971.)*

The effect of automobile exhaust particulates on visibility was determined using an integrating nephelometer to measure visibility degradation from light scattering. Exhaust was sampled from leaded and unleaded fuels, on cold and hot cycle runs, and from automobiles fitted with exhaust emission control equipment. The effect of time on light scattering was also determined. The particulates had a mass median diameter of about 0.2 micron at zero time, increasing to about 0.4 micron in two and a half hours; maximum light scattering occurred at about two hours. Individual light scattering due to carbon, lead, and other exhausted particulates was determined by regression data analysis. Carbonaceous particulates produced more than twice the light scatter of lead particulates. (Author abstract modified)

17656 APTIC NO. 35365

Teunissen, H. W.

CHARACTERISTICS OF THE MEAN WIND AND TURBULENCE IN THE PLANETARY BOUNDARY LAYER. *Toronto Univ. (Ontario), Inst. for Aerospace Studies, Air Force Contract F 33615-68-C-1055, UTIAS Review 32, 57p., Oct. 1970. 66 refs.*

NTIS, DDC: AD 722047

The characteristics of flow in the planetary boundary layer are investigated with respect to definitions and theories of turbulence, characteristics of the planetary boundary layer, and development of a mathematical model. Mean velocity and turbulence and the effect of thermal stability and surface conditions on these characteristics and examined. The analytical representation of the flow is based on the assumptions that the mean wind velocity is strong enough for a neutrally stable atmosphere; the assumption of frozen flow is valid; the gross features of the terrain are relatively uniform; the flow is stationary for periods at least as long as the record length used to obtain mean velocity values; the flow is homogeneous in any horizontal plane.

17657 APTIC NO. 35934

Tulin, Marshall P. and Josef Shwartz

HYDRODYNAMIC ASPECTS OF WASTE DISCHARGE. *J. Hydronautics, 6(1):8-15, Jan. 1972. 15 refs. (Presented at the American Institute of Aeronautics and Astronautics Fluid and Plasma Dynamics Conference, 3rd, Los Angeles, Calif., June 29-July 1, 1970, Paper 70-755.)*

Hydrodynamic effects arising in connection with the discharge of waste, including effects due to buoyancy and stratification, are examined for the rise of a hot chimney plume into a stable stratified atmosphere and the spreading of an underwater thermal discharge along the free surface of a moving body of water. The ideal bent-over and rising chimney plume comprises a self-similar self-convecting motion for which predictions are made with the aid of conservation laws. The cross flow theory, asymptotic results in a neutral atmosphere, the effect of increasing exhaust velocity on plume trajectory, plume buoyancy, and dispersion are discussed.

17658 APTIC NO. 35172

Vars, R. Charles, Jr.

AN ASSESSMENT OF SMOKE MANAGEMENT. *In: Research Relating to Agricultural Field Burning. A Progress Report. Oregon State Univ., Corvallis, Air Resources Center, p. 24-25, Feb. 1971.*

Successful smoke management via controlled field burning would be possible only if the variations in acreages burned and variations in local meteorology generate variations in visibility. Daylight visibility in the Willamette Valley, Oregon is a function of the load of contaminants, including field burning smoke, and the prevailing meteorological conditions. Smoke management based on regulation of total acres burned according to predicted weather conditions could reduce visibility losses from field burning smoke, particularly if there were a reduction in the total acreage to be burned.

17659 APTIC NO. 36027

Vekris, S. L.

DISPERSION OF COAL PARTICLES FROM STORAGE PILES. *Ont. Hydro Res. Quart., 23(2):11-16, 1971. 3 refs.*

Dispersion of dust from a large coal pile was examined and a theory developed for calculating the deposition at distances of a few thousand meters. Three phases are involved in the process: generation of airborne dust; dispersion by eddy diffusion; and deposition by gravitational settling and precipitation washout. The amount of material deposited is a function of distance, wind speed, atmospheric stability, emission rate, and particle size. The dust raised by vehicular movement was estimated from concentration measurements made close to the pile surface and the theory was used to calculate depositions based on this value. Comparison of theoretical predictions with dust fall data suggests that deposition of coal dust could be a major source of dust fall on rare and short-lived occasions. (Author abstract modified)

17660 APTIC NO. 35440

Wilson, Dean A.

THE KINEMATIC BEHAVIOR OF SPHERICAL PARTICLES IN AN ACCELERATING ENVIRONMENT. *National Oceanic and Atmospheric Administration, Boulder, Colo., Wave Propagation Lab., NOAA TR-ERL-187-WPL-13, 25p., Oct. 1970. 12 refs.*

The response of a spherical particle to an accelerating environment was investigated. Numerical analysis of the motion determined that particles of all sizes falling in a sheared environment are excellent tracers of the mean air motion. The time response of large spherical particles to an impulse of wind could be approximated by an exponential relationship. If there is a significant time variability of air motion, the relationship predicts that the instantaneous horizontal velocity of the air may not be adequately traced, because of the large inertial forces associated with large particles. The turbulent motion of the particle would be a smoothed form of air variability. If the turbulent motion is described by time variability, the variance of the spectrum of particle velocity will be smaller than the variance of air motion. The terminal velocity of a particle is altered by the occurrence of a horizontal wind gust, suggesting the presence of a covariance term between the horizontal and vertical motion. Only spherical particles for which the aerodynamic drag could be easily specified were considered. (Author summary modified)

17661 APTIC NO. 35470

Wood, John L.

THE NOCTURNAL URBAN HEAT ISLAND IN AUSTIN, TEXAS. *Texas Univ., Austin, Atmospheric Science Group, Rept. 28, 55p., May 1971. 21 refs.*

The existence of a heat island was determined in Austin, Texas on 12 evenings during August-December 1970. Data on the physical, industrial, and thermal background were collected and analyzed with respect to topography, vegetation, population, meteorologic factors (wind, temperature, humidity, precipitation, pressure, clouds), industrial activity (especially power plants), and traffic patterns. Hygrothermographs, thermistors, and continuous recorders were used to collect data on temperature distribution. The intensity of the heat island effect varied from 1.0-12.5 F. Dewpoint depression, water-air temperature difference, and total heat released by the power generating plants were positively correlated with the urban heat island intensity. The heat island was best developed under clear skies, winds at seven or eight knots, cold air temperature, low relative humidity, and high electrical power production.

17662 APTIC NO. 35748

Yamaki, Naoomi

VARIOUS PROBLEMS OF PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu o meguru shomondai). Text in Japanese. Preprint, Ministry of International Trade and Industry, Tokyo (Japan), Public Nuisance Resources Research Inst., p. 37-41, 1971. 2 refs. (Presented at the Public Nuisance Resources Research Institute Research Seminar, Tokyo, Japan, Oct. 6, 1971.)*

The correlation between photochemical smog and atmospheric elements was investigated with respect to measurements of hydrocarbons, nitrogen oxides, and oxidants. Based on the results of oxidant-producing experiments, when humidity is high or increases the time required for oxidants to reach maximum value decreases but the maximum value is lower. Humidity is high and sulfur dioxide concentration increases, the time required for oxidants to reach maximum value is prolonged and the maximum value decreases suggesting that a decrease in SO2 concentrations might increase oxidant concentrations. The main pollutants contributing to photochemical smog in Tokyo were carbon monoxide (99.7% from automobiles); nitrogen oxides (93.5% from factories and power plants and 35.9% from automobiles), hydrocarbons (97.9% from automobiles and 1.6% from factories and power plants); and sulfur oxides (99.% from factories and power plants and 1% from automobiles). Air pollution measurements in the United States are included.

17663 APTIC NO. 35747

Yokoyama, Nagayuki

DIFFUSION OF AIR POLLUTANTS. *(Taiko osenshitsu no kakusan). Text in Japanese. Preprint, Ministry of International Trade and Industry, Tokyo (Japan), Public Nuisance Resources Research Inst., p.43-49. 25 refs. (Presented at the Public Nuisance Resources Research Institute Research Seminar, Tokyo, Japan, Oct. 6, 1971.)*

Various dispersion experiments and studies on diffusion mechanisms are examined. Larger scale diffusion, mesoscale atmospheric phenomena, local wind types, sea, land, and valley winds, and urban heat islands contribute to more complex dispersion models. A study on lake winds and level and plumb temperature distributions at Lake Michigan is examined. Calculations are presented for forecasting air pollution by a relatively simple diffusion equation. For forecasting dispersion patterns under more complex topographical conditions, wind tunnel experiments are conducted and experiments based on dispersion differential equations are often used. Procedures of dispersion simulation and control devised by the Ministry of International Trade and Industry are examined, including the investigation of emission sources with respect to volume, sulfur dioxide content, temperature, stack height and diameter; determination of effective stack height; tracer experiments; local meteorological investigations of wind velocity and direction, turbulence intensity, and dispersion index; wind tunnel experiments; determination of the dispersion index, and pollution concentration and distribution. Theoretical and actual figures are correlated and the control method is determined.

17664 APTIC NO. 35421

Zrazhevskiy, N. M., V. N. Doroshenko, and N. G. Chepik

THE EFEECT OF OROGRAPHY ON THE CHARACTERISTICS OF THE AIR FLOW WITHIN THE AERODYNAMIC TUBE. *(Issledovaniye vliyaniya razlichnykh form rel yefa na kharakteristiki vozdushnogo potoka v aerodinamicheskoy trube). Text in Russian. Tr. Gl. Geofiz Observ. (Leningrad), no. 207:38-50, 1968. 14 refs.*

A model for the study of air flow variations as affected by orography is presented. The air flow studies are performed in an aerodynamic tube; while the imitation of an underlying surface is provided by fastening the investigated shape onto a screen. The size of the model is selected in such a manner as to exclude fringe or tubular wall effects. The model is oriented perpendicularly to the oncoming flow and measurements are made at different levels. The flow rate is measured by means of a cylindrical probe; the pressures are recorded manometrically and the degree of turbulence is measured with a thermo anemometer. The data are then computer-processed and graphs expressing the turbulence at different levels are presented in the text. Upon comparison with data retrieved from observations under natural conditions, a satisfactory agreement could be ascertained. The application of numerical methods and computers opens possibilities of taking into account the effect of the orography of a certain region on the diffusion process of industrial air pollutants.

BASIC SCIENCE AND TECHNOLOGY

17665 APTIC NO. 35076

SULFUR DIOXIDE AND CARBON DIOXIDE. *(Svaveldioxid och koldioxid). Text in Swedish. Mod. Kemi, no. 10:33-34, Oct. 1971.*

The production and use of sulfur dioxide and carbon dioxide are discussed with physical and chemical properties and the range of practical application. The most important production processes include compression and cooling, absorption in water, and deep-freezing. The description and parameters for the process applied in the Falun plant are given. In this method, production of sulfuric acid and liquid sulfur dioxide are combined so that smaller size equipment is required. The most important processes for carbon dioxide production consist of firing of liquid or gaseous combustibles of relatively high carbon contents in boilers, carbon dioxide contained in smoke is absorbed in aqueous solution of an alkaline absorbing medium. In another process, carbon dioxide is formed as a byproduct along with ammonium hydroxide production. Carbon dioxide is also gained from natural sources, and from fermentation processes. Storage of carbon dioxide is described, and main fields of application of carbon dioxide, including dry ice are, outlined.

17666 APTIC NO. 35684

Aitken, John

ON THE FORMATION OF DEFINITE FIGURES BY THE DEPOSITION OF DUST. *In: Collected Scientific Papers of John Aitken, LL.D., F.R.S. Cargill G. Knott (ed.), Cambridge, Cambridge University Press, 1923, Chapt. 30, p. 477-484. 1 ref.*

The formation of definite figures by the deposition of dust was observed with illuminated plates. An ordinary thin glass shade 12 cm in diameter was used for confining the dusty air. For illumination of narrow strip of incandescent gas mantle was hung over a Bunsen burner, exposing two thicknesses of the mantle to the flame. The air was examined by a hand lens of as high a magnifying power as possible. What is most surprising in the formation of dust figures is the important part the dustless film from the under side of the plate plays in protecting the upper surface from deposits of dust; whatever tends to destroy this dustless film tends to bring about conditions favorable for the dust settling on the plate. The effect of convection currents set up by the hot plate, gravitation, and the repelling action of the hot surface on the formation of dust figures is discussed.

17667 APTIC NO. 35046

Asano, Kiro and Kin ichi Uchigasaki

ABSORPTION OF SULFUR DIOXIDE IN N, N-DIMETHYLANILINE WITH CORONA DISCHARGE. *(N, N-jimechiru anirin ni yoru aryusan gasu no kyushu sokudo ni oyobosu korona hoden no eikyo). Text in Japanese. Tohoku Daigaku Hisuiyoeki Kagaku Kenkyusho Hokoku (Bull. Chem. Res. Inst. Non-Aqueous Solutions, Tohoku Univ.), 20(1):43-47, 1970. 4 refs.*

A corona discharge was applied for the study of the absorption of sulfur dioxide in the organic solvent, N,N-dimethylaniline. The effects of the electric current, the concentration of SO2, and the velocity of the gas flow upon KOG (transition index) were measured. The rate of the absorption was accelerated greatly by the corona discharge, and the value of KOG with the corona discharge was 7.1 times as large as that without the discharge, when the mole ratio of SO2 with N,N-dimethylaniline was 0.0135.

17668 APTIC NO. 35063

Berkowitz, J., W. A. Chupka, and David Gutman

ELECTRON AFFINITIES OF 02, 03, NO, NO2, NO3 BY ENDOTHERMIC CHARGE TRANSFER. *J. Chem. Phys., 55(6):2733-2745, Sept. 15, 1971. 67 refs.*

Lower limits to the electron affinities of the molecules oxygen, ozone, nitric oxide, and nitrogen dioxide were measured by determining the thresholds for endothermic charge transfer from iodine (-) to the corresponding molecules. The technique involves formation of I(-) by photoion-pair formation and measurement of the intensity of the product ion as a function of the energy available in the collision. The lower limits obtained are 02, 0.48 eV; 03, 1.96 eV; NO, 0.09 eV; and NO2, 2.04 eV. The threshold for the reaction of I(-) with nitric acid was also measured. Aeronomic implications are discussed. (Author abstract modified)

17669 APTIC NO. 35862

Blank, Richard Eugene

MOLECULAR CONSTANTS OF NO2 FROM HIGH-RESOLUTION ABSORPTION SPECTRA AND MAGNETIC CIRCULAR DICHROISM AND MAGNETIC CIRCULAR BIREFRINGENCE OF NO AND NO2. *Michigan State Univ., East Lansing, Dept of Physics, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1970, 111p. 30 refs.*

High-resolution near-infrared absoprtion spectra of the (0,0,3), (1,0,3), and (3,0,1) vibration-rotation bands of nitrogen dioxide were analyzed on the basis of the slightly asymmetric top molecule. Least squares methods were used to compare the observed-to-predicted transitions, and iterative procedures yielded the upper state constants for the bands. This data along with the (1,0,1) and (2,0,1) bands were used to predict improved vibrational and vibration-rotation interaction constants. Spin splitting was determined in the (0,0,3) band and analyzed to give spin-rotation interaction constants. Magnetic circular birefringence and dichroism studies for nitric oxide and NO2 are examined. Experimental spectra were determined which were qualitatively in agreement with previous experimental and theoretical predictions. (Author summary modified)

17670 APTIC NO. 35683

Bloch, Winston N., Jr., William J. Moorman, Kenneth A. Busch, Jerry F. Stara, and Trent R. Lewis

SWIMMING AS A LABORATORY METHOD FOR EXERCISING DOGS. *Preprint, Air Pollution Control Office,* *Cincinnati, Ohio, Div. of Health Effects Research, 17p., 1970 (?). 11 refs.*

Swimming as a laboratory method for exercising dogs without prior training is described for use in physiologic evaluation of response to stress by the intact organism in experimental situations where training is not possible, e.g., studies of chronic inhalation toxicology. After swimming for three minutes in a water tank, dogs showed a 69% average increase in heart rates; their arterial p02 increased 21.3 mm Hg; pCO2 decreased 6.0 mm Hg; and pH decreased 0.034 units. These responses to exercise are similar to those found when intact, unanesthetized dogs are permitted to run on a threadmill. The electrocardiograms at one and three minutes after the swims revealed sinus arrhythmia/tachycardia and a premature ventricular contraction one minute after exercise in one dog. Five minutes after swims, sinus arrhythmia/tachycardia predominated over sinus arrhythmia. Electrical axes were changed little. ST-segment elevation and depression were uncommon and never exceeded 0.5 mm from the unipolar and limb leads, or 0.8 mm from the precordial leads. (Author summary modified)

17671 APTIC NO. 35978

Brown, Farrell B. and Nina G. Charles

BARRIERS TO LINEARITY IN TRIATOMIC MOLECULES. I. DEVELOPMENT OF A CURVILINEAR QUANTUM MECHANICAL MODEL APPROPRIATE FOR LARGE AMPLITUDE BENDING MOTION IN TRIATOMIC MOLECULES OF C2V SYMMETRY.

J. Chem. Phys., 55(9):4481-4488, Nov. 1, 1971. 15 refs.

A classical kinetic energy expression is developed for a nonlinear triatomic molecule of C-sub 2v symmetry with two degrees of freedom. These are changes in the valence angle plus K-type rotation about the molecular z axis whose moment vanishes as the molecule becomes linear. The bonds are considered rigid, and the z axis is assumed fixed in space, but no other assumptions are made; in particular, neither small amplitude vibrations nor a nearly linear equilibrium configuration is assumed. The quantum mechanical operators are obtained and vibration-rotation eigenvalues are obtained for two cases: rectilinear motion applicable only to small deviations from a nearly linear equilibrium geometry; and curvilinear motion applicable to any bending amplitude or any equilibrium geometry. The former case follows as a special condition of the latter case. For each kinetic model the wave equation is solved using potential functions identical in form, and the results illustrate the fallacy of placing the entire burden of unevenly spaced vibrational levels upon the potential energy expression. Furthermore, it has been demonstrated that eigenvalues can be obtained from a five-term recursion relation which arises in the solution for the second case. The example of sulfur dioxide is used. (Author abstract modified)

17672 APTIC NO. 35378

Carpenter, Kathleen E.

THE LEAD MINE AS AN ACTIVE AGENT IN RIVER POLLUTION.

Ann. Appl. Biol. (London), 13(3):395-401, 1926. 6 refs.

Investigation of the effects of a lead mining and dressing operation on a neighboring stream showed slight but definite deterioration of the river after 12 months of partial activity, despite sedimentation practices. The pollution while the mine was active was of the same type as the effects which persisted after closure. The responsible agents were traces of metallic solutions (lead, zinc, copper, and iron) derived from direct action of the water upon the solid mine waste; the solid waste in itself was harmless.

17673 APTIC NO. 35379

Carpenter, Kathleen E.

ON THE BIOLOGICAL FACTORS INVOLVED IN THE DESTRUCTION OF RIVER-FISHERIES BY POLLUTION DUE TO LEAD-MINING.

Ann. Appl. Biol. (London), 12(1):1-13, Feb. 1925. 4 refs.

The biological factors involved in the destruction of river fisheries by pollution due to lead mining were investigated. The chemical alteration of the water at flood times after heavy precipitation was an agent in the destruction of fish. The index to the fatal character of the flood water was the presence of soluble lead. Death of the fish was ultimately referable to a chemical interaction between a secretion of the skin and the lead dissolved in the surrounding medium, producing a colloidal substance which, when present in sufficient quantity, inhibited respiration.

17674 APTIC NO. 35132

Deriagin, B. V., Lu. I. Ialamov, and V. S. Galoian

THEORY OF THE MOTION OF MODERATELY COARSE VOLATILE AEROSOL PARTICLES IN HETEROGENEOUS GASES.

(Teoriya Dvizheniya umerenno krupnykh letuchikh Aerozolnykh chastits v neodnorodnykh gazakh). Text in Russian. Dokl. Akad. Nauk SSSR, 201(2):383-385, 1971. 7 refs.

A contribution to the theory on volatile aerosol particle diffusion rates is presented in an attempt to solve the problem of aerosol trapping from gas flows. Equations describing the distribution of motion rates, pressures, and concentrations of these particles within a gas flow are developed. A full strain tensor and the total force acting upon one of such particles are calculated. This latter force consists of a sum including the diffusion force and the viscosity resistance force of the diffusion medium. The rate of diffusion depends mainly on the Knudsen number, which approaches zero values in cases of large particle size.

17675 APTIC NO. 35232

First, M. W., D. W. Underhill, A. S. Goldin, H. Yusa, P. C. Reist, T. Baldwin, H. A. Trindade, S. H. Lee, and D. W. Moeller

SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.

Harvard School of Public Health, Boston Mass., Air Cleaning Lab., Atomic Energy Commission Contract AT(30-1)841, 73p., Oct. 1970. 26 refs.

NTIS: NYO-841-23

Methods and apparatus were developed to measure the coefficient of thermal conductivity of layers of elemental sodium combustion products (aerosols) deposited on heat exchange surfaces. The evolution of iodine(131) from a sodium peroxide system as a function of time, temperature, and carrier gas (nitrogen) flow rate was also studied. Optical properties of sodium aerosols were studied to develop relationships between the visibility, aerosol concentration, and time for such smoke and to identify the light scattering properties of the cloud. All data indicated the opaque nature of the aerosol cloud. Evaluations of fission gas adsorption beds were also made. A series of equations were developed to accurately describe concurrent adsorption and chemical reaction of gases in packed granular beds. These equations gave the statistical moments of the breakthrough curve and present a straightforward, rapid means for calculating breakthrough curves. A useful feature of the equations is that they provide a method for calculating the fraction of adsorbate which will pass through the bed unreacted. (Author summary modified)

17676 APTIC NO. 35639

Gelboin, Harry V., Eliezer Huberman, and Leo Sachs

ENZYMATIC HYDROXYLATION OF BENZOPYRENE AND ITS RELATIONSHIP TO CYTOTOXICITY. Proc. Natl. Acad. Sci. U. S., 64(4):1188-1194, Dec. 1969. 15 refs.

Aryl hydrocarbon hydroxylase, an inducible microsomal enzyme system, was measured in cultures of normal and transformed hamster, mouse, and human cells. In order to determine the highest level of enzyme, the cells were induced by pretreatment with benz(a)anthracene. A correlation was found between the level of enzyme activity and the susceptibility of the cells to the cytotoxicity produced after treatment with benzopyrene. The results indicate that aryl hydrocarbon hydroxylase is the enzyme system responsible for cell susceptibility to the cytotoxic effect of benzopyrene and the toxic effect of benzopyrene is due to its enzymatic conversion to a cytotoxic metabolite. One of the products of the enzymatic hydroxylation of benzopyrene, 3-hydroxybenzopyrene, was found to be cytotoxic to cells that were either susceptible for resistant to the cytotoxic effect of benzopyrene. (Author abstract)

17677 APTIC NO. 35299

Golser, Leopold, Hans-Martin Weitz, and Walter Appelt

SEPARATION OF BROMINE FROM GASEOUS MIXTURES CONTAINING OXIDES OF NITROGEN.

(Badische Anilin- und Soda-Fabrik A. G., Ludwigshafen (West Germany)) U. S. Pat. 3,592,601. 2p., July 13, 1971. 3 refs. (Appl. Oct. 22, 1968, 1 claim).

For the separation of bromine from gaseous mixtures which, in addition to bromine, contain oxides of nitrogen with less than pentavalent nitrogen and with or without nitrosyl bromide, at least as much oxygen is added as is necessary for converting the nitrogen of the oxides or nitrosyl bromide into the pentavalent state. These mixtures are then treated with water or dilute aqueous nitric acid. The process is preferably carried out at atmospheric pressure and at temperatures up to 50 C above the boiling point of bromine. The reaction may be carried out in a column such as is normally used for distillation processes. (Author abstract modified)

17678 APTIC NO. 35175

Hardison, John R.

CHEMICAL CONTROL OF DISEASES OF GRASS SEED CROPS.

In: Research Relating to Agricultural Field Burning. A Progress Report. Oregon State Univ., Corvallis, Agricultural Experiment Station and Oregon State Univ., Corvallis, Air Resources Center, p. 21-22, Feb. 1971.

Results to date of numerous on-going studies of chemical control of diseases of grass seed crops as a substitute for open field burning indicate that fungus diseases and infections of seeds are the most difficult to control; protectant fungicides will be useless. Systemic chemicals tested so far have been ineffective. The most promising chemicals are not yet registered for use. Improvements in the mobile field uncinerator suggest that it will be the first practical substitute for open field burning in disease control.

17679 APTIC NO. 35169

Hester, J. A.

STUDY OF FLY ASH AS A MATERIAL FOR USE IN CONCETE.

Alabama Highway Dept., Birmingham, Bureau of Research and Development, HPR Rept. 51, 48p., June 1970.

NTIS: PB 199116

Results are given of an extensive investigation of various sources of fly ash for use as an admixture in concrete. Materials gathered for the project included type I and type II cement, No. 4 to 1 1/2-inch limestone, siliceous coarse aggregate, fly ash from three different sources, concrete sand, and air entraining agent. Concrete beams and cylinders were molded from the mixtures. Compressive, flexural, and split tensite tests were made. Investigations were also made of the damage caused by freezing and thawing of concrete pavement and bridges. All mixtures tested produced good average concrete. Type I cement produced higher early strengths than type II, but in one to two years, most mixes show nearly the same strength. Observateous of structures already built containing fly ash show good condition and no apparent reaction to date.

17680 APTIC NO. 35079

Hillier, I. H. and V. R. Saunders

A THEORETICAL INTERPRETATION OF THE BONDING, AND THE PHOTOELECTRON AND ULTRAVIOLET SPECTRA OF SULPHUR DIOXIDE.

Mol. Phys., 22(2):193-201, Sept. 1971. 25 refs.

With the aid of extensive calculations, the interpretation of the photoelectron spectra and ground-state geometry of sulfur dioxide is considered in detail, in the hope of further elucidating the nature of the third orbital participation in the molecule. To aid the analysis, the species sulfur monoxide, ozone, and oxygen are also considered. Wave functions for some of the lower lying excited states of SO2 were obtained by the method of configuration interaction, thereby allowing a tentative theoretical interpretation of the observed ultraviolet spectra.

17681 APTIC NO. 35267

Hoppel, W. A. and S. G. Gathman

CHARGE TRANSPORT THROUGH AN AEROSOL CLOUD.

J. Appl. Phys., 41(5):1971-1977, April 1970. 8 refs.

The system of coupled equations which governs the electric field, ion densities, and aerosol charge in a quiescent cloud between semi-infinite charged plates is solved numerically for the case when ionization is confined to a layer near each plate and for the case of volume ionization. The results predicted by the governing equations were verified experimentally. The electrical stress produced in the case of a volume ionization tends to stabilize the fluid whereas surface ionization can produce hydrodynamic instability. The electroconvective instability produced by surface ionization is easily observable both visually and electrically. If turbulence is generated in the chamber by mechanical means, the turbulent transfer of charge will oppose the conduction current in the case of volume ionization and enhance the total current in the case of surface ionization. (Author abstract)

17682 APTIC NO. 35200

Huebner, A. L.

THE EFFECT OF CHARGE TRANSPORT ON LIQUID JETS AND LIQUID DROPS. (INTERIM REPORT).

(North American Rockwell Corp., Canoga Park, Calif., Rocketdyne, Office of Naval Research Contract N00014-67-C-0474, Identification 094-358/2-2-67 (Code 429), R-8731, 65p., May 27, 1971. 46 refs.

NTIS, DDC: AD 724334

Comparison was made between calculated values of the size of drops formed from electrified jets and experimental results in which an apparatus was employed that progressively approached the model used in the theory. Initially, it was planned to verify the laboratory drop-size measurements by a frozen-drop technique with high-velocity (non-laboratory) jets formed from straight tubes similar to those employed int he laboratory tests. However, uncharged and slightly charged jets formed in this way yield drops that are too large to be used with the technique. An alternate procedure, involving use of a typical rocket engine injector element, was developed. A critical analysis of the literature on charged drops indicated the need for development of comprehensive model of charged-drop behavior. A model was developed which includes the influences of the charge on the drop; external electric fields applied to the drop; surface tension; and hydrodynamic influences. The relationship of this model to design of experimental apparatus for the study of charged-drop behavior is delineated. In addition the influence of factors such as corona discharge, heat transfer, and evaporation are considered and related to the dynamics of charged-drop behavior. A brief discussion of the physics of the dielectric constant of gases is given. The influence of the ambient gas dielectric constant is strongly dependent on gas density, and the permittivity of the gas rarely exceeds that of vacuum by a factor of more than 1.2 or so.

17683 APTIC NO. 35270

Jones. F. L., P. M. Becker, and R. J. Heinsohn

APPLICATION OF COMPUTER SIMULATION TECHNIQUES TO THE PREDICTION OF FLAME GAS EMISSIONS: THE EFFECTS OF ELECTRIC FIELDS ON FLAME PROPERTIES. *Preprint, American Inst. of Chemical Engineers, New York, 23p., 1971. 41 refs. (Presented at the American Institute Chemical Engineers National Meeting, 70th, Atlantic City, N. J., Aug. 29 - Sept. 1, 1971, Paper 37b.)*

An opposed-jet methane-oxygen-nitrogen diffusion flame was simulated by computer using finite-difference methods of solution. A 21-reaction kinetic mechanism was used, including the principal hydrocarbon combustion reactions, ion-molecule reactions, and nitric oxide equilibrium reactions. Simulated electric fields were applied across the flame resulting in changes in temperature, heat release rate, and specie concentrations similar to those observed by other experimenters. The simulation was found to represent the flame processes well, predicting concentration and temperature profiles in good agreement with experiment. (Author abstract modified)

17684 APTIC NO. 35651

Jones, F. Nowell

OLFACTORY THRESHOLDS IN THE INTERNATIONAL CRITICAL TABLES. *Science, 118(3064):333, Sept. 18, 1953. 2 refs.*

Olfactory thresholds in the International Critical Tables are expressed as molecules/cc of air. Because of an error in the formula used to translate threshold data into this common unit, the thresholds in the tables are in error by a factor of 100. The Avogrado number, which is the basis of the calculation, should read 6.023 times 10 to the 23rd power, not 6.06 times 10 to the 21st power. A simple procedure for correcting table values is given.

17685 APTIC NO. 35143

Kestin, J., S. T. Ro, and W. A. Wakeham

REFERENCE VALUES OF THE VISCOSITY OF TWELVE GASES AT 25 C. *Trans. Faraday Soc., 67(584):2308-2313, Aug. 1971. 34 refs.*

Reference values are reported for the viscosity of 12 gases measured in an oscillating disc viscometer at atmospheric pressure, zero density (whenever possible), and at 25 C. The gases are hydrogen, methane, carbon monoxide, ethylene, ethane, oxygen, carbon dioxide, propane, butane, sulfur dioxide, carbon tetrafluoride, and sulfur hexafluoride. As measured by long-range reproducibility, the precision is plus or minus 0.04%, whereas the accuracy is estimated to be plus or minus 0.1%. Linear temperature corrections are listed for viscosity at 25 C with an uncertainty of plus or minus 2.5%. (Author abstract modified)

17686 APTIC NO. 35239

Khvan, Ye. A., B. F. Sadovskiy, and N. A. Voskresenskiy

SOME CHEMICAL AND COLLOIDAL PROPERTIES OF CURING SMOKE. *(Nekotoryye kolloidno khimicheskiye svoystva koptilnogo dyma). Text in Russian. Rybn. Khoz. (Moscow), no 7:43-45, July 1968.*

Sawdust containing 15% moisture was used to generate curing smoke under controlled temperature conditions ranging from 350 to 600 C. The size distribution of smoke particles was determined with a cascade-type device which included five cascade units and an aerosol filter at its exit. Smoke produced at 550C was sized by impactor. The amount of dispersed phase found on the filter bottom decreased with increased particle size; this amount was determined gravimetrically. The curing smoke generated under these conditions appeared to be a highly dispersed aerosol system with 80% of its particles smaller than one micron. The generating temperature from 350 to 600 C caused the smoke concentration to increase from 8.0 to 170.0 mg/cu m. The relationship between smoke temperature and generating temperature appeared to be linear.

17687 APTIC NO. 35312

Kotrappa, P.

SHAPE FACTORS FOR QUARTZ AEROSOL IN RESPIRABLE SIZE RANGE. *J. Aerosol Sci., 2(3):353-359, Aug. 1971. 12 refs.*

Shape factors were determined for quartz particles in the respirable size range of 0.2 to 2.0 micron projected area diameter. Particles were sorted into about 25 narrow size intervals using the Stoeber aerosol spectrometer. The volume shape factor remained fairly constant at 0.34 over a size range of 0.7 to 2.0 micron. The surface shape factor averaged over the size range of 0.2 to 2.0 micron was 5.2. Systematic variations were found between the dynamic shape factor and the average projected area diameter and between the projected area resistance shape factor and the projected area diameter. They are expressed in functional relationships between the shape factors and the projected area diameter. No physically consistant single spheroid model satisfying these shape factors could be found. Typical electron micrographs examined at different size ranges tend to indicate that the particles were randomly oriented upon deposition. Number and mass distributions were nearly lognormal and the standard procedure of computing mass median diameter from the number distribution using the Hatch and Choate equation was satisfactory. (Author abstract)

17688 APTIC NO. 35323

Maher, K. E., G. J. McClure, and J. J. Leventhal

ELECTRON TRANSFER AND ION-ATOM INTERCHANGE IN C(+)-CO COLLISIONS. *J. Chem. Phys., 55(12):5549-5550, Dec. 15, 1971. 5 refs.*

Kinetic-energy distributions of carbon monoxide(+) and C2(+) ions resulting from C(+)-CO collisons were measured over the incident ion kinetic-energy range 13-30 eV. The apparatus employed was a primary ion gun which directed a mass-selected C(+) beam into a collison cell containing low-pressure CO gas. Ions emerging in the forward direction were velocity and mass analyzed and detected with a particle multipler. Reaction energetics were calculated from the measured kinetic-energy distributions. The CO(+) distributions provide strong evidence that this product is formed by both electron transfer and ion-atom interchange. In addition to the major (forward scattered) peak in the C2(+) distribution, small yields of C2(+) were detected at 180 deg in the center-of-mass system. (Author abstract modified)

17689 APTIC NO. 35329

Padva, Y. Yu.

THE DISTRIBUTION OF AEROSOL CONCENTRATIONS IN A TURBULENT GAS STREAM. *(Raspredeleniye kontsentratsii aerozolya v turbulentnom potoke). Text in Russian. Vodosnabzh. i Sanit. Tekhn., no 8:25-28, 1971. 5 refs.*

A simplified model for the study of turbulent diffusion of particles suspended in a gas flow is suggested in an attempt to find an analytical solution to the problem. Aerosol concentration within a linear gas flow, assuming constancy of gas flow and neglecting molecular particle diffusion, turbulent particle diffusion along the flow direction and inertial effects occurring when particles pass from one layer to another was considered as a simplified model. The analytical solution of the regular linear motion of the gas flow allowed computation of constant coefficients for the equation describing the process. The solution indicated a regular particle distribution along the section of the air flow, assuming that particles which settled on the tubular wall did not reenter the gas flow. The action of the gas flow rate upon the efficiency of dust trapping devices such as settling chambers or electrostatic filters is determined by the actual particle size distribution of the suspended phase.

17690 APTIC NO. 35119

Rose, John B. and Vincent McKoy

APPLICABILITY OF SCF THEORY TO SOME OPEN-SHELL STATES OF CO, N2, AND O2. *J. Chem. Phys., 55(12):5435-5441, Dec. 15, 1971. 22 refs.*

The SCF Hamiltonians for many open-shell states of diamtomic molecules are expressed only in terms of the Coulomb and exchange operators of closed shell SCF theory. With these results, conventional SCF programs have been used to solve for the SCF wavefunctions for many interesting states of molecular nitrogen, molecular oxygen, and carbon monoxide. However, the SCF theory runs into serious trouble if electron correlation is important in determining the relative locations of two excited states. (Author conclusions modified)

17691 APTIC NO. 35556

Rossler, F.

DETERMINATION OF THE ABSORPTION COEFFICIENTS OF SOOT PARTICLES OF VARIOUS FLAMES. *Optik (Stuttgart), 6(3):145-151, 1950. 8 refs. Translated from German. Central Electricity Generating Board, London (England), Information Services, 7p.*

Determination of the true temperature of flames from a measurement of the black body and color temperatures alone is, according to an earlier study, only possible if the wavelength dependence of the absorption capacity is known. It is possible to carry out such a determination conveniently on soot deposited from the flames. Transparency measurements were carried out with a monochromator, a photo cell, and an electrometer amplifier. They extended over the visible spectrum and the neighboring ultraviolet and infrared spectra. (Author abstract modified)

17692 APTIC NO. 35634

Sehmel, G. A.

THE DEPOSITION OF AEROSOLS BY TURBULENT FLOW PROCESSES WITHIN VERTICAL TUBES. *Preprint, American Institute of Chemical Engineers, New York, 36p., 1968. 17 refs. (Presented at the American Institute of Chemical Engineers, Regional Meeting, Corvalis, Oregon, Feb. 2, 1968.)*

Variables affecting turbulent deposition of particles on walls of vertical tubes were studied. A diffusion model was first developed, in which diffusion was assumed to proceed until particle velocity is large enough to cause deposition over a final free-flight distance to the wall. Experimental deposition data were then analyzed in terms of the model to calculate the required particle velocity and the particle position at the start of the free-flight. The calculated constants show a wide range of values which bracket the values assumed for existing deposition models. Deposition of one to 28 micron particles was measured in 0.20, 0.62, 1.152, and 2.81 in diameter aluminum tubes. Narrow uranine or uranine-methylene blue particles generated with a spinning-disc aerosol generator were passed through the tubes. The results are reported as deposition velocities for each tube size as a function of flow rate, Reynolds number, and particle size. In many instances, the measured radial flux profile of particles in a tube was nearly the inverse of the velocity profile. In these cases, an annulus within about 0.2 in. of the wall had a much higher particle concentration than the center region of the tube. Normal flux profiles with a low flux near the wall were observed for small particles and for tacky surfaced tubes. The deposition velocity data are a function of an average airborne particle concentration next to the tube wall. (Author abstract modified)

17693 APTIC NO. 35311

Shelef, M. and J. T. Kummer

THE BEHAVIOR OF NITRIC OXIDE IN HETEROGENEOUS CATALYTIC REACTIONS. *Chem. Eng. Progr. Symp. Ser., 67(115):74-92, 1971. 98 refs.*

A comprehensive review is presented of the chemisorption behavior of nitric oxide and of the gas-phase heteorgeneous catalytic reactions of nitric oxide that lead to the products nitrogen and nitrous oxide. Physico-chemical properties, thermodynamics, and bonding behavior are considered. The bonding type of nitric oxide can be studied by magnetic measurements, by which the participation of the odd electron in the bond is probed, or by measuring the change in the bond strength between the nitrogen and oxygen atoms, as manifested by the change in the vibration frequency of this bond, using absorption in the infrared. The chemisorption of nitric oxide on chromia, iron oxide, and carbon is mentioned. The heterogeneous decomposition of nitric oxide is discussed, as well as important features of the reduction reactions. Reduction by ammonia and carbon are cited. Some speculative generalizations concerning the mechanisms of, and the selection of catalysts for, the reactions of nitric oxide are offered. (Author abstract modified)

17694 APTIC NO. 36016

Sprung, J. L., H. Akimoto, and J. N. Pitts

NITROGEN DIOXIDE CATALYZED CIS-TRANS ISOMERIZATION OF CIS-2 BUTENE. *J. Am. Chem. Soc., 93(18):4358-4363, Sept. 8, 1971. 32 refs.*

The gas-phase kinetics of the nitrogen dioxide-catalyzed isomerization of cis-2-butene to trans-2-butene were studied. At room temperature, NO2 pressures of 0.1-3.0 Torr, and cis-2 butene pressures of 1.0-30 Torr, the gas-phase reaction was first order in both reactants and appeared to be homogeneous. At room temperature, the reaction had a second-order rate constent of 0.148 plus or minus 0.003 1/mol/sec. Between 298-338 K, the Arrhenius parameters of the reactions were log A (1/mol/sec) equals 8.1 plus or minus 0.2 and Ea equals 12.1 plus or minus 0.3 kcal/mol. Thermochemical calculations show that these Arrhenius parameters are consistent with a free radical isomerization mechanism. (Author abstract modified)

17695 APTIC NO. 35212

Vakhlamov, S. V.

COMPUTATION OF THE TRAJECTORY OF A JET IN A DRIFTING FLOW. *Inzh. Fiz. Zh., 7(10):111-116, 1964. 8 refs. Translated from Russian. Foreign Technology Div., Wright Patterson AFB, Ohio, Translation Div., 8p., June 13, 1966.*

NTIS, DDC: AD-639159

A formula for computing the trajectory of a jet of compressed gas in a latural flow was derived from the equation of the amount of motion in projections onto coordinate axes. Trajectories computed by the method are in good agreement with experimental data and with predictions based on other equations. (Author abstract modified)

17696 APTIC NO. 35412

Visnapuu, L. Yu.

A DEVICE FOR AEROSOL PRODUCTION. *(Ustroystvo dlya polucheniya aerozoley). Text in Russian. Med. Tekhn., no. 5:26-29, 1968. 4 refs.*

A device for preparing aerosols from substances decomposing below their boiling point is described in which aerosol is formed by adiabatic expansion of compressed air (containing vapors of the substance) above the level of the liquid. Quantitative expressions of operating and performance paramaters of the device are presented. A laboratory was tested using water. Formation of fog was observed in the chamber at air pressure between 1 and 4 atms, water temperature between 17 and 65 deg and an ambient air temperature of 18 deg. Aerosol of any temperature can be obtained by charging the temperature of the water in the chamber.

17697 APTIC NO. 35890

Wilson, Haydn

METHOD AND APPARATUS FOR THE MEASUREMENT OF THE SHARE OR PARTIAL PRESSURE OF A GAS MIXTURE COMPONENT. *(Verfahren und Vorrichtung zum Messen des Anteils oder Partialdruckes einer Komponente in einem Gasgemisch). Text in German. (Kent Instruments Ltd., Luton (England) Swiss Pat. 506,069. 4p. May 28, 1971. (Appl. May 8, 1970, 2 claims).*

A method is described for determining the partial pressure of a gas mixture component (for wxample, the oxygen content of a gas mixture) by measuring its chemical potential (as free partial molar energy) with an electrochemical cell. Such cells require temperatures between 400 and 500 C. When the gas temperature is below this range, a gas sample is deflected from the main stream and heated. A sample of the gas mixture is supplied to the electrochemical cell by placing the test tube containing the cell into the gas outlet duct. The gas flows through the test tube due to the heat provided from the outside by convection, or the gas may be pumped into the test tube and then either be discharged into the atmosphere or returned to the main waste gas stream. The gas flow intensity can be regulated adjusting the orientation of the test tube in the gas flow. While one end of the test tube reaches into the discharge duct with its open end, the other end, with two electrodes attached to its walls, is built into a T-form with a electrical heating coil.

17698 APTIC NO. 35937

Zuev, V. E., V. P. Lopasov, and M. M. Makogon

USE OF HIGH-SPEED LASER SPECTROSCOPY TO STUDY THE ABSORPTION SPECTRUM OF ATMOSPHERIC GASES. *Appl. Opt., 10(11):2452-2455, Nov. 1971. 18 refs.*

Absorption coefficients of water vapor in a multipass cell were measured with a laser spectrometer based on a tunable ruby laser. The main parameters of the experimental installation were: wavelength tuning during the pulse, 0.5A (natural scanning), and 1.4 A (electrooptical scanning); static tuning from one pulse to another within 5.0 A (accomplished by crystal heating); width of radiation spectrum in the peak of the order of 0.01 A. Based on preliminary estimates, the error of measurements of the absorption coefficient does not exceed 10-12%.

EFFECTS-HUMAN HEALTH

17699 APTIC NO. 35041

Ministry of Health and Welfare (Japan) and Osaka Prefectural Government (Japan)

REPORT ON THE EFFECT OF SMOKE AND DUST. *(Baien to eikyo chosa hokokusho. Showa 44 nendo ban). Text in Japanese. 85p., 1969.*

Environmental monitoring and medical examinations have been carried out since 1965 to study the effect of air pollution on the health of school children. The Fuku elementary school, located in the district of the worst environmental condition in Osaka City, the Ikeda elementary school in a residential area, and the Nishiura elementary school in a rural area were examined. Annual fluctuation of dust fall in the polluted area was higher than that in the non-polluted area. From the determination of sulfur oxides by the lead dioxide method, a polluted area showed an average value of 3.29 sulfur trioxide mg/day/100 sq cm and a non-polluted area showed 0.71 SO3 mg/day/100 sq cm. The amount of floating dust in a polluted area was twice more and four times more than that in a non-polluted area, measured by digital dust counter and high volume air sampler respectively. Metallic content, such as lead, nickel, vanadium, copper, zinc, and cobalt, was remarkably high at a polluted area. Medical examinations were carried out three times a year. According to the questionnaire, subjective symptoms of sore throat, headache, and cough or sputum were frequently reported at the polluted school. Forced vital capacity and timed vital capacity were low at schools in the polluted area according to the pulmonary function test by vitalor.

17700 APTIC NO. 35042

TRACE METALS: UNKNOWN, UNSEEN POLLUTION THREAT. *Chem. Eng. News, 49(29):29, 30, 33, July 1971.*

The toxicity of trace metals is well documented. Lead, cadmium, arsenic, antimony, and beryllium have all caused accidental deaths in industry. The most critical concern to public health experts today, however, is for subtle physiological changes caused by trace metals that may go completely undetected or, if detected, be attributed to other causes. Also, synergistic and antagonistic relationships among trace metals must be defined. Current confusion surrounding standards for trace metals is illustrated by the wide gap between U. S. and Soviet industrial standards for metals; often U. S. standards are a hundredfold higher than those in the USSR. Sources and health effects are listed tabularly for nickel, beryllium, boron, arsenic, mercury, cadmium, antimony, lead, and other compounds. Investigations have indicated that arsenic, as well as selenium and tellurium, may be acted on by bacteria in nature to produce highly poisonous compounds. The mechanism for the methylation of mercury is mentioned. Another factor which must be added to this tangled riddle is that of the still unknown health benefits of trace elements and combinations of these.

17701 APTIC NO. 35072

Musashi National Sanitorium (Japan) and Fuji Hospital (Japan)

STUDIES ON CHRONIC EFFECT OF CO (ELECTRON MICROSCOPIC STUDY IN NERVOUS SYSTEM). *(Issankatanso no mansei eikyo ni kansuru kenkyu (Shinkei kei ni okeru denshikenbikyo teki kenkyu)). Text in Japanese. 8p., 1970 (?).*

Cerebral lesions caused by acute carbon monoxide poisoning were produced in cats. The causal mechanism of cerebral lesions was studied. Electron microscopic observations of the cerebrum of adult cats were performed. Reversible acute CO poisoning was studied on cats with a unilaterally ligated common carotid artery. Chronic poisoning symptoms were produced by the infusion of five cc/kg of 760 mmHg CO gas into the abdominal cavity twice a day; then the cerebral tissues were examined with an electro microscope. No information was gained about the role division between various Anoxics which affect the degeneration of the white substance due to CO gas. However, the electron microscopic studies showed that CO spoils the respiratory enzyme of the Cytochrom-Oxydense system and cerebral lesions due to cyanogen are similar to each other.

17702 APTIC NO. 35570

GUIDES FOR SHORT-TERM EXPOSURES OF THE PUBLIC TO AIR POLLUTANTS. II. GUIDE FOR

HYDROGEN CHLORIDE. National Academy of Sciences, Nationa Research Council, Washington, D. C., Committee on Toxicology, Air Pollution Control Office Contract CPA 70-57, 15p., Aug. 1971. 31 refs.

NTIS: PB 203464

At sufficiently high concentrations, hydrogen chloride acts as a primary irritant, especially to the eyes and the moist mucous membranes of the respiratory tract. Effects of exposures of animals to HCl are cited, as well as the physiological responses of man to HCl. Although concentrations between 75 and 150 mg/cu m have been reported to be tolerable for periods up to one hour, inhalation of 1500 mg/cu m is dangerous within one hour. Odor thresholds are indicated, including the threshold of injury for plants. Short-term and emergency exposure limits are recommended. Effects on materials are mentioned, and analytical methods are described.

17703 APTIC NO. 35714

MOONSHINE: THE ROTGUT RACKET. *Licensed Beverage Industries, Inc., New York, 25p., 1971.*

Illegal distilling activities in the United States are discussed. The information and statistics presented were obtained from various field investigations and from Federal, state, and local law enforcement agencies. Pertinent news accounts are also used to illustrate the health, economic, and social problems generated by moonshine. An overall sharp decrease is reported in the number of still seizures and in moonshine production. However, while production on the local level decreased from 531 gallons in 1968 to 478 gallons in 1969, production on the state level increased from 11.8 million gallons to 12.5 million gallons. Due to the poisonous lead salts found in the product, moonshine consumers are subject to sudden death, permanent blindness and paralysis, or chronic lead poisoning. In two southern cities, 90-91% of seized batches of illicit liquor contained lead salts. As noted by a Federal report, mothers who drink moonshine contaminated by the salts can give birth to babies with serious physical defects.

17704 APTIC NO. 35174

Acocella, G.

CHEMOTHERAPY OF EXPERIMENTAL LEAD POISONING. NOTE II. EFFECTS OF NICOTINIC ACID ON COPROPORPHYRINURIA IN LEAD POISONED RATS. *(Studio sulla chemioterapia dell intossicazione sperimentale da piombo. Nota II. Effetti dell acido nicotinico sulla coproporfirinuria da intossicazione saturnina nel ratto). Text in Italian. Acta Vitaminol. (Milan), 20(5):195-202, 1966. 20 refs.*

A survey of the literature on lead poisoning in the rabbit, rat, and man indicated that the biological change common to the three species is increased urinary coproporphyrin excretion. This index was used to evaluate the effectiveness of nicotinic acid in treating rats intoxicated with lead acetate. Different doses of lead acetate (300 and 100 mg/kg/day/os) were administered for different periods of time (21 and 45 days); treatment with nicotinic acid (50 mg/kg/day intramuscularly) began either simultaneously with the administration of lead acetate, or after 10 or 45 days. Though reported to reduce human and rabbit coprophoryinuria, nicotinic acid did not modify urinary coproporphyrin excretion in the lead-poisoned rats. The different behavior of the rats is attributed to a species difference; hence results obtained with one species should not be extended to another. (Author summary modified)

17705 APTIC NO. 35334

Allison, A. C.

LYSOSOMES AND THE TOXICITY OF PARTICULATE POLLUTANTS. *Arch. Internal. Med., vol. 128:131-139, July 1971. 51 refs. (Presented at the Hanford Biology Symposium on Pollution and Lung Biochemistry, Richland, Wash., June 5, 1970.)*

The effects of silicon dioxide and asbestos particles on cells were reviewed. The pathogenesis resulting from inhaled particulate pollutants centers around their effects upon the macrophage. The mechanisms of destruction of the macrophage by particulates and the correlation with fibrogenesis were analyzed. Silica (silicon dioxide) alters the secondary lysosomal membrane through hydrogen bonding, rendering it permeable to the contained lysosomal enzymes. Asbestos produces similar effects to a lesser extent. Fibrogenesis occurs through macrophage damage and the release of undetermined factors. The prevention of silica toxicity by polyvinylpyridine N-oxide and the high incidence of tuberculosis in conjunction with silica are discussed. (Author abstract modified)

17706 APTIC NO. 35522

Baker, F. D. and C. F. Tumasonis

MODIFIED ROLLER DRUM APPARATUS FOR ANALYZING EFFECTS OF POLLUTANT GASES ON TISSUE CULTURE SYSTEMS. *Atmos. Environ., 5(10):891-893, Oct. 1971. 5 refs.*

Gey's roller drum technique was adapted to expose cell cultures to quantitated volumes of gaseous pollutant and to determine its effect on cellular and biochemical parameters. Glass impingers, one-inch in diameter and six-inches long, were expecially adapted to receive a 90 deg ground-glass connector at the inlet port and also to hold glass slides. The outlet port is plugged with cotton. A glass manifold provides for the distribution of gases to each of the 32 impingers positioned on the outer periphery of the roller drum. The stainless steel roller drum is 18-inches in diameter, and is housed within an insulated and thermostatically controlled cabinet. Rotational speed of the drum is controlled by a vari-speed regulator. The system described and the initial results of carbon monoxide exposure on cell growth and lactate dehydrogenase levels indicate its utility in studies of the effects of extended exposure to pollutant gases. (Author abstract modified)

17707 APTIC NO. 35211

Ball, Gene V. and Jean M. Morgan

CHRONIC LEAD INGESTION AND GOUT. *Southern Med. J., vol. 61:21-24, Jan. 1968. 20 refs.*

Thirty-four patients with gout were hospitalized in a Birmingham, Alabama, hospital in 1965. Thirteen of these patients had abnormally high urinary lead levels and 12 of the 13 were anemic. Only one of the 13 was not a moonshine drinker; however, he had burned batteries for two years. The mean serum urate level (8.1 plus or minus 1.24 mg for 100 ml) in the saturine gout patients was higher than in controls. Creatinine clearance values represented moderately severe impairment of kidney function. Both sets of values indicated renal retention of uric acid in the patients. It is likely that moonshine serves not only as a vehicle for lead and thereby a sustained rise in serum urate, but also leads to intermittent, even more marked elevations in the serum urate levels, perhaps provoking an acute gout attack at its apogee.

17708 APTIC NO. 35377

Barltrop, Donald

THE EXCRETION OF DELTA-AMINOLAEVULINIC ACID BY CHILDREN. *Acta Paediat. Scand. (Stockholm), vol. 56:265-268, May 1967. 14 refs.*

Twenty-four-hour urine specimens were collected from 339 children aged 0-12 years admitted to the hospital over an 11-month period. The mean excretion of delta-aminolevulinic acid per 24 hours was 1.61 mg with a range of 0.0-6.5 mg, 95% of the values falling between 0.08-4.39 mg/24 hours. The mean excretion of ALA was 0.08 mg/kg body weight 24 hours; this value did not vary with age. A seasonal variation in ALA excretion was observed, with maximum values in the winter months and minimum values in the summer. Since the excretion of ALA may be closely related to the non-skeletal or metabolically active lead status of the body, it is important to define the normal excretion of ALA. (Author summary modified)

17709 APTIC NO. 35225

Barriero, Ofelia C.

EFFECT OF CYSTEINE ON 5-AMINOLAEVULINATE HYDROLYASE FROM LIVER IN TWO CASES OF EXPERIMENTAL INTOXICATION. *Biochem. Pharmacol., vol. 18:2267-2271, 1969. 25 refs.*

The effect of sulfhydryl groups of cysteine on the activity of 5-aminolaevulinate hydrolyase (delta-aminolevulinic acid, hydratase) extracted from the liver of animals receiving chemical compounds known to disturb the porphyrin metabolic pathway was described. The free -SH groups, delta ALA, and protein content in rat and rabbit liver were measured. Female rats were given subcutaneous injections of allylisopropylacetamide (AIA) (400 mg/kg) at 24 hr intervals. Twenty four hours prior to the first dose of AIA, food was withheld until sacrifice 18-24 hours after the last dose of AIA. Fasted control animals were given only two injections of saline solutions. Acute lead poisoning was induced in rabbits by the daily injection of a solution of lead acetate (20 mg Pb^{+2}/ml, pH 5.5) with a dosage range of 20-40 mg Pb^{+2}/kg of body weight per day during eight days and sacrificed four hours after the last injection. The activity of delta ALA dehydratase in vitro with no preincubation with Cy varied, giving smaller values for fasted normal rats than for fed normal rats. At the same time, livers from rats which received AIA gave lower results than those from normal fasted rats. Lower delta ALA hydratase activity values were observed in livers of animals treated with Pb^{+2}. Delta ALA content were higher in treated than in normal rabbit livers. The same result was obtained for free -SH group contents.

17710 APTIC NO. 35486

Basu, P. K., G. Lusis, and R. Dhurandhar

THE EFFECT OF AIR POLLUTANTS ON THE EYE. II. A STUDY OF THEIR EFFECT ON THE OCULOCARDIAC REFLEX. *Can J. Ophthalmol., vol. 6:136-138, 1971. 6 refs.*

Albino rabbits were subjected to electrocardiographic studies following exposure of their eyes to acrolein drops. Ocular drops of acrolein produced tachycardia in eight rabbits under general anesthesia and bradycardia in eight animals receiving both general and local anesthesia. In eight other animals under both general and local anesthesia, but with the parasympathetic system blocked by atropine, bradycardia was not observed. This study indicates that irritation of the eye by a constituent of smog can produce bradycardia by a reflex mechanisms under certain circumstances.

17711 APTIC NO. 35280

Baxter, H. G.

THE DESIGN, OPERATION AND HAZARDS OF A DETERGENT ALKYLATE PLANT. *Ann. Occupational Hyg., vol. 14:137-143, 1971. 3 refs.*

The design, operating techniques, and safety measures employed to ensure the safe handling of the potentially hazardous chemicals in an alkylation unit using anhydrous hydrogen fluoride as a catalyst are described. Thermax, Dowtherm A, and Diphyl are trade names for an eutectic mixture of 26.5% diphenyl and 73.5% diphenyl oxide; splashes in eyes cause irritation and pain. Protective clothing is indicated. Details of the medical supervision and hygiene monitoring considered necessary are given. Benzene vapor can cause acute poisoning in concentration s of 3000 ppm, while brief exposures can cause effects on the blood forming tissues. Hydrogen fluoride can produce irritation of the respiratory tract membranes. The threshold limit values for benzene, hydrogen fluoride, and propylenetetromer are 25, 3.0, and 500 ppm, respectively. (Author abstract modified)

17712 APTIC NO. 35382

Bell, R. F. and J. C. Gilliland

URINARY LEAD-210 AS INDEX OF MINE RADON EXPOSURE. *Radiol. Health Safety Mining Milling Nucl. Mater., Proc. Symp., Vienna, Austria, 1963, vol. 2:411-423, 1964. 7 refs. (Aug. 26-31.)*

Urinary and fecal excretions of lead-210 were studied in dogs for two years after a single intravenous injection of 1 microcurie Pb-210. Fecal excretions were less than 1% of the urinary excretions. The cumulative percentage of urinary excretion of the initial dose was 2.5% the first day, 8% the first year, and 10% in two years. Creatinine clearance edathamil calcium disodium and (EDTA) provocative urinary excretion of Pb-210 were also studied. On the basis of these animal experiments, the EDTA provocative urinary excretion of Pb-210 is being studied in underground uranium miners. Some partial data show the relation between EDTA excretions and environmental exposure to radon are given.

17713 APTIC NO. 35134

Blundi, Edmundo

AIR POLLUTION AND ITS ACTION UPON THE RESPIRATORY SYSTEM. *(Poluicao atmosferica: acao sobre o aparelho respiratorio). Text in Portuguese. Rev. Brasil. Med., 28(6):247-251. June 1971.*

The impact of air pollution upon the population and measures to be taken in fighting air pollution are discussed. Industrial emission sources, automotive vehicles, and open air burning of refuse are the main contributing factors to air pollution in Brasil. No scientific proof defining specific diseases induced by air pollution had been found so far. However, air pollution may worsen pre-existing conditions in patients with bronchitis, asthma, emphysema or cardiopulmonary conditions which constitute the major part of victims due to pollution. Graphs representing the parallelism between smoke and sulfur dioxide concentrations in the air and the exacerbation of pulmonary disease in groups of patients held under control are reproduced. A program of preventive measures including early diagnosis and treatment of pulmonary disease should be developed. Complex teams including clinical physicians, lung specialists, allergists, and specialists in nuclear medicine should be established to prevent air pollution-induced episodes. Technical measures should be taken to prevent industrial, automotive, and other burning emissions.

17714 APTIC NO. 35760

Bonashevskaya, T. I. and D. P. Partsef

EXPERIMENTAL INVESTIGATION OF THE BIOLOGICAL EFFECT OF MICROCONCENTRATIONS OF PENTANE AND HEXANE MIXTURE IN THE AIR. *(Eksperimentalnyye issledovaniya biologicheskogo deystviya mikrokontsentratsiy smesi pentana i geksana v vozdukhe). Text in Russian. Gigiena i Sanit., no.9:11-15, 1971. 4 refs.*

The action of chronic exposure (by inhalation) to saturated hydrocarbons such as pentane-hexane mixtures (equal parts) on the central nervous system of albino rats was investigated. Animals were exposed to 3.0, 10.4, 50.9, or 94.4 mg/cu m hydrocarbon mixture concentrations, comparable to those existing in polluted city air. The rats were kept in exposure chambers 24 hr daily. Functional alterations of the central nervous system were well correlated to the hydrocarbon concentrations applied in the exposure chambers. Lowest chronaxy of antagonistic muscles was observed in rats exposed to highest concentrations of hydrocarbons. These functional alterations were confirmed by the histological findings on brain cortex preparations and reflected the amounts of distorted dendritic structures. However, no alterations in blood cholinesterase levels were detected in the experimental animals, possibly because of insufficient sensitivity of the analytical method. Histological investigation of liver preparations indicated inhibition of glycogen synthesis (to a certain extent) in rats exposed to 50.9 and 94.7 mg/cu m hydrocarbon mixture concentrations. Histological data appeared to be well correlated with those of antagonistic muscle chronaxy.

17715 APTIC NO. 35188

Bouhuys, Arend

AIRWAY DYNAMICS AND BRONCHOACTIVE AGENTS IN MAN. *In: Airway Dynamics. Arend Bouhuys (ed.), Springfield, Charles C. Thomas, 1970, Chapt. 19, p. 263-284. 27 refs.*

The pressure-flow-volume relations in the lungs of man are affected by bronchodilator as well as bronchoconstrictor agents. In healthy subjects, isoproterenol increases airway conductance; however, maximum expiratory flow rates do not increase and may even decrease. The increase of conductance is attributed to widening of airways under conditions of low transmural pressures; the lack of increase in maximum flow rates is attributed to increasing collapsibility of large airways owing to decrease of their bronchial smooth muscle tissue. After bronchoconstrictor agents, the usual response to minumum effective doses is a decrease of maximum flow rates with little or no conductance decrease. This effect is attribted to narrowing of small airway resistance. A study of 25 men exposed in a factory to hemp dust, an agent known to cause lung disease, showed symptoms of chest tightness and in decreases of maximum flow rates in the majority of subjects; in these, airway conductance decreases only when the dust effect is severe. A minority of the subjects had no symptoms or flow rate changes but a decrease of conductance. The flow rate response may result from a pharmacologic effect of hemp dust on small airways, while the conductance response may be caused by a mechanical or reflex effect of the dust on large airways. The results demonstrate the need to study maximum flow rates as well as airway conductance when assessing human response to inhaled agents. (Author abstract modified)

17716 APTIC NO. 35792

ruin, A. de and R. L. Zielhuis

TOXICOLOGICAL APPRAISAL OF LEAD AS PUBLIC HEALTH HAZARD. *Tijdschr. Soc. Geneesk, vol. 49:855-859, 1971. 31 refs.*

The total daily absorbed amound of lead in the general population is 36 to 45 micrograms, depending on the extent of environmental pollution; only 12 to 19% is absorbed through the respiratory tract. Essential metabolic processes will not be significantly altered by these low exposure levels, but there is likely to be increased body storage in subjects living in urban areas. The potential toxic effects of progressive storage of minute amounts of lead cannot be discounted, especially in certain vulnerable groups. The groups include children, pregnant women, and subjects with impaired kidney function. The additional reasearch needed to verify the vital significance of low-level effects should be conducted with emphasis on these groups. Preventive measures should be directed not only at respiratory uptake but even more at oral uptake.

17717 APTIC NO. 35438

Byers, Randolph K. and Elizabeth E. Lord

LATE EFFECTS OF LEAD POISONING ON MENTAL DEVELOPMENT. *Am. J. Dis. Child., 66(5):471-494, Nov. 1943. 16 refs.*

A follow-up study was conducted of 20 school children who had been hospitalized in infancy or early childhood because of lead poisoning. The presence or absence of evidence of involvement of the nervous system bore no relation to the eventual intellectual development of the children; indeed, the only truly successful member of the group had the most severe encephalopathy encountered among the 20 children. With the one definite and a second possible exception, none of the children succeeded in school. Throughout the psychologic examination of the children with good intelligence levels and poor scholastic attainment, sensorimotor defects were found in most instances. Other evidences of interferference with the normal development of the nervous system were found.

17718 APTIC NO. 35559

Cassells, David A. K. and E. C. Dodds

TETRA-ETHYL LEAD POISONING. *Brit. Med. J. (London), 1946:681-685, Nov. 9, 1946. 11 refs.*

The properties of tetraethyl lead are briefly reviewed, and the opportunities to develop tetraethyl lead poisoning in Great Britain are described. Twenty-five cases of tetraethyl lead poisoning of varying degrees of severity occurred during tank-cleaning operations, and six of the cases are described in detail. The earliest symptoms of lead poisoning in these 25 cases were disturbance of sleep and symptoms in the alimentary tract. Other symptoms are indicated, as well as the diagnosis and treatment of lead poisoning. Urinary lead concentrations will give some idea of the degree of exposure. (Author summary modified)

17719 APTIC NO. 35380

Chisolm, J. Julian, Jr.

CHRONIC LEAD INTOXICATION IN CHILDREN. *Develop. Med. Child. Neurol. (London), 7(5):529-536, Oct. 1965. 40 refs.*

The serious sequelae of lead intoxication during early childhood are mental retardation, behavior disturbances, convulsive disorders, and nephropathy. The protean symptoms of this chronic disease and the paucity of specific abnormal physical signs make a biological approach essential for accurate diagnosis. Fundamentally, the diagnosis requires the demonstration of an excessive body burden of lead together with some metabolic evidence of toxic effects in soft tissues. In children, serial determinations of lead concentration in whole blood provide the best means for following trends in total body lead burden and its distribution. When blood determinations give equivocal results, the edathamil calcium disodium (EDTA) mobilization test can be used to detect increased body lead. The cornerstone of therapy is prompt interruption of abnormal lead exposure. Even so, the excessive body burden may persist for months or years after excessive intake is halted. To reduce and maintain soft tissue lead concentrations at close to normal levels, more use should be made of chelating agents in long-term managements. (Author summary modified)

17720 APTIC NO. 35387

Chisolm, J. Julian, Jr.

THE USE OF CHELATING AGENTS IN THE TREATMENT OF ACUTE AND CHRONIC LEAD INTOXICATION IN CHILDHOOD. *J. Pediat., 73(1):1-38, July 1968. 92 refs.*

The pharmacologic aspects of chelation are reviewed with particular reference to agents useful in lead intoxication, i.e., 2,3-dimercapto-1-propanol (BAL), edathamil (CaEDTA), and d-penicillamine. Toxicologic studies determined that prompt institution of chelation therapy with the combination of BAL and edathimil calcium disodium, together with appropriate supportive therapy can substantially reduce the mortality rate of acute encephalopathy in children with lead intoxication. Blood level concentrations were reduced to normal levels during a five day course of BAL-EDTA therapy, and initial urinary lead output was far greater with BAL-EDTA in patients with encephalopathy. The critical factors of treatment were prompt institution of chelation therapy, delayed for only the time needed to establish urine flow; witholding of all oral fluids and restriction of parenteral fluids; avoidance of hypertonic agents; avoidance of surgery; and suppression of seizures. Doses of d-penicillamine maintained blood lead concentrations within normal limits and suppressed urine delta-aminolevulinic acid output to normal during diuresis of lead. Daily doses of 20-40 mg/kg administered to children convalescing from plumbism were efficacious and without serious side effects.

17721 APTIC NO. 35560

Chisolm, J. Julian, Jr.

DETERMINATION OF DELTA-AMINOLEVULINIC ACID IN PLASMA. *Anal. Biochem., vol. 22:54-64, 1968. 6 refs.*

A method for the determination of delta-aminolevulinic acid in plasma is reported. The procedure is adapted from the ion-exchange resin chromatography procedure of Mauzerall and Granick for the determination of ALA in urine. Normal fasting children and fasted patients with symptomatic lead intoxication for acute intermittent porphyria were studied. The mean normal value found in healthy subjects was 0.056 micrograms/ml. This method is best suited to the study of acutely ill patients in whom the concentration of ALA in plasma is increased four to 40-fold. (Author summary)

17722 APTIC NO. 35883

Cralley, Lewis J.

ELECTROMOTIVE PHENOMENON IN METAL AND MINERAL PARTICULATE EXPOSURES: RELEVANCE TO EXPOSURE TO ASBESTOS AND OCCURRENCE OF CANCER. *Am. Ind. Hyg. Assoc. J., 32(10):653-661, Oct. 1971. 26 refs. (Presented at the American Industrial Hygiene Association, Annual Meeting, Detroit, Mich., May 1970.)*

Exposures to metallic particulates, individually and in alloys, along with mineral particulates may give rise to an electromotive phenomenon wherein high levels of biologically active cations are produced at localized tissue sites. The relative position of the involved metals in the electromotive series along with the nature and concentration of the cations. This phenomenon may account for otherwise unexplained exacerbations of diseases, sensitization reactions, carcinogenicity, latency periods, and other responses. The potential role of this phenomenon in exposure to metals in asbestos in recognized, and supporting data are presented. (Author abstract)

17723 APTIC NO. 35468

Daly, Charles

AIR POLLUTION AND CAUSES OF DEATH. *Brit. J. Prevent. Social Med. (London), vol. 13:14-27, 1959. 11 refs.*

Indices of air pollution from domestic and industrial sources in the 83 county boroughs of England and Wales were calculated, using information on fuel consumption in defined built-up areas. These indices were correlated with death rates from bronchitis, pneumonia, respiratory tuberculosis, lung cancer, and other respiratory diseases among middle-aged males. The results show a relatively close association between these measures of air pollution and bronchitis, and a relatively low association between air pollution and lung cancer. Allowance for social class differences between towns reduces but does not abolish the correlation with bronchitis mortality. Various hypotheses for the variations in mortality are given. An attempt was made to measure the effect of air pollution from sulfur products by studying the power stations in or near each town. The results give no reason to suppose that proximity to a power station has any noticeable effect on bronchitis mortality. (Author summary modified)

17724 APTIC NO. 35308

Davis, Harvey V. and Andrew L. Reeves

COLLAGEN BIOSYNTHESIS IN RAT LUNGS DURING EXPOSURE TO ASBESTOS. *Am. Ind. Hyg. Assoc. J., 32(9):599-602, Sept. 1971. 10 refs.*

A cell-free system capable of catalyzing both the incorporating of proline into a peptide chain and its subsequent hydroxylation to hydroxyproline was obtained from rat lung tissue. These transformations are the key event in collagen biosynthesis, and their rate is controlled by the activity of the enzyme proline hydroxylase. Proline hydroxylase activity was measured as hydroxyproline: proline ratio after in cubation of lung extract with carbon-14 labeled proline. In preparations obtained from animals which received intratracheal injection of crocidolite dust, the ratio was elevated, indicating that tissue reaction to asbestos dust apparently commences with stimulation of collagen biosynthesis. In preparations obtained from animals exposed to asbestos dusts by prolonged inhalation, the ratio was depressed. The latter animals had advanced fibrotic responses in their lungs. (Author abstract)

17725 APTIC NO. 35454

Domenici, Folco

EXPERIMENTAL STUDIES OF MODES OF ABSORPTION IN MERCURY VAPOR INTOXICATION0. *)Ricerche sperimentali sulle v½e d' assorbimento nell intossicazione da vapori di mercurio). Text in Italian. Rass. Med. Ind., 10(12):703-711, Dec. 1939. 19 refs.*

Guinea pigs exposed to vapors from petri dishes filled with mercury at 5 C in a wooden box died within two to four days. Besides lesions of almost all organs caused by diffusion, autopsy disclosed a vast necrotic-hemorrhagic lesion of the large intestine, a sign of elimination of the toxic material. The same experiment performed with guinea pigs in whom the aesophagus was surgically removed also revealed the above lesions. These experiments, in which the temperature did not favor the condensation of mercury vapors on the skin and on mucous membranes, indicate that all mercury enters the body by way of the respiratory tract. Thus, where mercury vapors are inhaled at temperatures lower than the body temperature of the organism, they are absorbed exclusively by the respiratory and not by the digestive tract. This explains the meningheal lesions and nervous disorders manifest in the clinical picture of this type of occupational poisoning.

17726 APTIC NO. 35663

Douglas, J. W. B. and R. E. Waller

AIR POLLUTION AND RESPIRATORY INFECTION IN CHILDREN. *Brit. J. Prevent. Social Med. (London), vol. 20:1-8, 1966. 6 refs.*

Information was obtained on the health of a sample of 3866 children from their birth in 1946 until they reached school-leaving age in 1961. Between them, the children have lived in 2689 different administrative areas since birth. Each of these areas was classified into one of four pollution categories based primarily on domestic coal consumption in 1952, and the data on respiratory infection were analyzed with respect to these categories. Comparisons made later between the predicted categories and the measured amounts of pollution in some of the areas showed a satisfactory agreement. The information on illness was obtained during interviews with the mothers when the children were aged two to four years, and during examinations by school doctors when the children were aged six, seven, 11, and 15 years. Hospital admissions were also recorded and special absence records were kept at the school when the children were aged 6.5 to 10.5 years. The results showed that lower respiratory tract 0infections were related to the amount of air pollution, but upper respiratory infections were not. The frequency and severity of lower respiratory tract infections increase with the amount of air pollution. Boys and girls were similarly affected, and no difference was found between children in middle class and working class families. The association between lower respiratory tract infection and air pollution was found at each age examined. (Author summary modified)

17727 APTIC NO. 35120

Driscoll, Dennis M.

BASE LINES FOR MEASURING ADVERSE EFFECTS OF AIR POLLUTION: SOME EVIDENCE FOR WEATHER EFFECTS ON MORTALITY. *Environ. Res., 4(3):233-242, Aug. 1971. 22 refs.*

In many air pollution studies it is assumed that other factors which may influence the daily death rate in a community are negligible or randomized. One of these is weather, and a study was undertaken to determine if provision should be made for the suspected effects of everyday, or nonextreme, weather. Daily deaths in 10 large cities in the United States were correlated with weather elements for the months of January, April, July, and October of the years 1962-1965. In addition to showing the effects of spells of hot, humid weather, and pollution episodes (extreme weather), it was determined that large interdiurnal changes of temperature, dewpoint, and pressure are accompanied by fluctuations in daily mortality. This applies to the north central and northeastern United States, where increases in mortality are coincidental with prefrontal weather, and decreases with postfrontal weather. Thus, there appear to be fluctuations in daily mortality on days which are the meteorological opposite of those on which pollution is most serious. (Author abstract)

17728 APTIC NO. 35531

Edwards, R.

THE POLYCHLOROBIPHENYLS, THEIR OCCURRENCE AND SIGNIFICANCE: A REVIEW. *Chem. Ind. (London), no. 47:1340-1348, Nov. 20, 1971. 70 refs.*

The polychlorobiphenyls, with a very widely dispersed use throughout industry, have very similar properties to the chlorinated hydrocarbon pesticides, but are even more thermally and chemically stable. Properties and uses of the polychlorobiphenyls are cited. It is now well established that PCBs can be found in wildlife in many areas of the environment. The highest levels are generally associated with the industrial areas and the adjacent freshwater and marine food chains. Soon after the beginnings of industrial use of the chlorinated naphthalenes and biphenyls early in this century, human exposure lead to skin eruptions while animal inhalation and feeding experiments revealed liver damage to occur with the chlorinated naphthalenes. A number of toxicological experiments are described, as well as gas chromatography retention time data. The significance of PCBs (and pesticides) to man and other organisms must be seen in the context of sublethal effects having long-term influence on populations through the media of reproductive processes and teratogenic and carcinogenic effects on both the parent and later generations.

17729 APTIC NO. 35671

Eglit, M. E.

BIOLOGICAL ACTION OF LOW CONCENTRATIONS OF OZONE. *(Biologicheskiye deystviya malykh kontsentratsiy ozona) Text in Russian. Aktual Voprosy Gig. Truda Prof. Patol., Mater. Konf., 1st 1967, p. 77-80. 6 refs.*

Investigation of the biological activity of low concentrations of ozone showed that ozone affects the human organism when present in concentrations of .01 mg/cu m and above. The lowest concentration causing olfactory sensation in sensitive persons participating in the experiment was .015 mg/cu m, while the lowest concentration having an effect on the electric activity in the brain was .01 mg/cu m. A specific spectrophotometric method for determination of atmospheric ozone concentrations with the aid of dihydroacridine is described. The sensitivity of the method is .0042 micrograms per ml. The effect of ozone concentrations of .11-.0054 mg/cu m on white rats was studied after 93 days of continuous exposure using Physiological, biochemical, and other techniques. A concentration of .11 mg/cu m caused pathologic changes in the lungs, kidney, spleen, heart, and brain.

17730 APTIC NO. 35789

Fenters, James D., Richard Ehrlich, John Findlay, James Spangler, and Vivian Tolkacz

SEROLOGIC RESPONSE IN SQUIRREL MONKEYS EXPOSED TO NITROGEN DIOXIDE AND INFLUENZA VIRUS. *Am. Rev. Respirat. Disease, 104(3):448-451, Sept. 1971. 10 refs.*

Squirrel monkeys were challenged with four periodic intratracheal injections of mouse-adapted influenza A/PR/8 virus while exposed to filtered air or five ppm nitrogen dioxide for 169 days, 24 hrs/day, seven days/week. Hemagglutination-inhibition antibodies were not affected by the exposure to NO2 and appeared much sooner than the serum neutralizing antibodies. Initial production of the serum neutralizing antibody appeared to be influenced by exposure to NO2; however, after 133 days, no significant differences were observed in the production of hemagglutination inhibition or serum neutralizing antibodies, body temperature, respiratory function, body weight, and hematologic values between control and experimental monkeys. Histopathological examination of the lung indicated that the focal alveolar edema was present in all but one of the monkeys exposed to NO2; however, the additive effect of NO2 exposure and influence virus challenge was not apparent. (Author summary modified)

17731 APTIC NO. 35418

Ferris, Benjamin G., Jr.

USE OF PULMONAY FUNCTION TESTS IN EPIDEMIOLOGIC SURVEYS. *Bull. Physio-Pathol. Respir. (Nancy), vol. 6:579-594, Sept. 1970. 12 refs.*

Although a standard questionnaire is necessary to obtain specific socio-economic and occupational data, it has limited use in respiratory surveys. Tests of pulmonary function appear to be more specific. Those suggested for regular use include peak expiratory flow rate, forced vital capacity, 1-sec forced expiratory volume, and volume-flow relationship measured at the mouth. Of the physiologic tests for specific aspects of pulmonary function, the oscillation method of measuring respiratory resistance may not have sufficient sensitivity for survey use. Measurement of the diffusing capacity for carbon monoxide while breathing air and high oxygen appears useful, although rejection rates are higher than for the simple pulmonary function tests. Lung volumes can be obtained by single breath helium dilution or chest X-rays. The number and complexity of tests to be used in epidemiologic surveys will depend on survey objectives, time, money, and personnel available, and the degree of cooperation from the study population.

17732 APTIC NO. 35463

Freeman, Ronald

REVERSIBLE MYOCARDITIS DUE TO CHRONIC LEAD POISONING IN CHILDHOOD. *Arch. Disease Childhood (London), vol. 40:389-393. 1965. 23 refs.*

The case history of a three-year-old girl with myocarditis occurring in the presence of chronic lead poisoning and encephalopathy is described. The diagnosis of lead poisoning was made on a history of eating lead-containing paint and was confirmed by laboratory investigations and the response to sodium calcium edetate. Myocarditis was diagnosed by the presence of cardiac failure in association with T wave changes in the electrocardiogram. The rapid reversal of the clinical and electrocardiographic signs of myocarditis during treatment of the lead poisoning with sodium calciumedetate implied that lead was responsible for the cardiac changes. The absence of hypertension and of signs of nephropathy suggested that the myocardial impairment was due to the direct action of lead on the heart. Electrocardiographic studies for possible myocardial damage should be part of the management of a patient with chronic lead poisoning. Supportive measures may be life-saving in children with lead encephalopathy because undiagnosed myocarditis could cause death.

17733 APTIC NO. 35099

Fujino, Toshiyuki, Hidehiko Oshima, and Masayuki Imai

SURVEY ON MORBIDITY, MORTALITY, MEDICAL EXAMINATION OF THE RESIDENTS, AND MEDICAL EXAMINATION OF SCHOOL CHILDREN AND APPROVED VICTIMS OF ENVIRONMENTAL HAZARD. *(Rikanritsu shiboritsu juminkenshin gakudokenshin kogai nintei kanja ni taisuru chosa). Text in Japanese. In: A study of the administration method of medical care fore sufferers from public nuisance in Yokkaichi City. Committee of Mie Prefectural Medical Insurance on Public Nuisance (Japan), p. 1-55, March 1970.*

Using 1968 s National Health Insurance data from three areas in Yokkaichi City, the morbidity of various diseases was examined. The diseases which showed significantly higher morbidity at contaminated area were pharyngitis, cold with bronchitis, and bronchial asthma. The eye disease was slightly more frequent in the contaminated areas. No difference was observed in the morbidity of pneumonia, pulmonary tuberculosis, lung cancer, pulmonary emphysema, or allergy dermatitis. Bronchial asthma was observed more frequently among aged people from 1961. The number of deaths classified by cases and mortality were studied based on the 1968 s death certificates of all the areas in Yokkaichi City. The mortality due to obstructive respiratory diseases had increased a great deal since 1963 in the contaminated areas, and this tendency was remarkably observed in highly contaminated areas. The mortality due to malignant neoplasm was slightly higher in the contaminated areas. Medical examinations were given to 391 people of over 16 years old who either lived or worked in 12 areas of Yokkaichi City, and who continuously suffered from coughing or sputum for more than three months, who suffered from attacks of asthma, or who suffered from anhelation (?) from just working on level ground. People suffering from chronic bronchitis (cough or sputum for more than three months in a year with this condition lasted more than two years), asthma, and anhelation were 33.0%, 37.8%, and 43.4%, respectively, of those with asthma. The influence of smoking habits or sex were not observed. An examination of respiratory functions was carried out on the sixth grade children of two elementary schools in contaminated areas and non-contaminated areas. A tendency toward conjestion of respiratory tracts was observed among the school children of contaminated area.

17734 APTIC NO. 35154

Funabashi, Shigeru, Tatsuya Hayashi, Toshiyuki Nishimuta, Nobukiyo Sakurai, Masaru Mizoguchi, Keiji Kishimoto, Toru Takayama, Yoshiko Muramatsu, Ryotaro Tochigi, Yoshio Takayama, Katsumi Yamada, Akira Sato, Sekka Ryu, Shu Terashima, Tsuyoshi Toba, Junichi Ito, Misako Murata, Suzuko Uehara, Seiji Kubo, Masao Matsumura, Kozo Ito, Motoaki Adachi, Ken Motomiya, and Ryo Yoshida

AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA. *(Taikiosen to shoni kikanshizensoku. Sono 1: osenchiku no zensoku hindo ni tsuite). Text in Japanese. Shonika Shinryo (J. Pediat. Pract.), 34(11): 1422-1428, Nov. 1971. 41 refs.*

Health examinations were undertaken on infants and schoolchildren in Fuji City, a highly polluted area in Shizuoka prefecture. The correlation between the prevalence of infantile asthma and air pollution is discussed. According to sulfur dioxide levels, Fuji City was divided into a highly polluted area (SO2 mean concentration in a year was 0.05-0.07 ppm), an intermediate area (0.03 0.05 ppm), and a low pollution area (below 0.03 ppm). Schoolchildren were selected elementary schools in the three areas by a questionnaire or nurse-teacher, and diagnosis of asthma was ascertained by detailed examinations. Fujinomiya City, adjacent to Fuji City, was selected as the control area. The prevalence value of asthma in schoolchildren in 1968 was high in the highly polluted area; however, a statistically significant difference was not recognized between this area and the other two areas. The prevalence of asthma in children in the highly polluted area in 1970 was about three times that in the lowest polluted area, and its difference was significant. The prevalence of asthma in the intermediarily polluted area showed a medium value between the highes and lower polluted areas. A significant difference was statistically reocognized between the highly and intermediarily polluted areas. The prevalence of asthma curve in the lowly polluted area intended to become lower as the grade increased, while the curve in the highly polluted area showed two peaks in the third and fourth grades. The difference between low and high values was remarkable. The prevalence of infantile asthma was investigated on 325 infants in two highly polluted districts in Fuji City. Its prevalence was five or ten times that in the Ichihara district in Chiba prefecture. Thus, the prevalence of asthma in each grade of children in Fuji City is highest in the polluted area, and it has a tendency to keep pace with SO2 concentrations.

17735 APTIC NO. 35164

Garcia-Palmieri, Mario R., Raul Costas, Jr., Mercedes Cruz-Vidal, Marcelino Cortes-Alicea, Angel A. Colon, Manuel Feliberti, Angel M. Ayala, Dolores Patterne, Rafael Sobrino, Raquel Torres, and Emilio Nazario

RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO. *Circulation, 42(3):541-549, Sept. 1970. 13 refs. (Presented at the American Heart Association, Scientific Sessions, 42nd, Dallas, Tex., Nov. 14, 1969.)*

In spite of an apparently increasing mortality rate from coronary heart disease in Puerto Rico, the age-specific mortality rate from this illness is considerably lower in the island than in the U. S. mainland. Examination of 9814 Puerto Rican urban and rural men in the 45 to 64-yr age group revealed sizable and statistically significant differences in monthly income, cigarette smoking, ingestion of fats, blood pressure, heart rate, relative weight, serum cholesterol, serum glycerides, prevalence of diabetes, prevalence of hypertension (lower in rural dwellers), vital capacity, consumption of calories per unit body weight, and physical activity (higher in rural areas). No urban-rural difference in coronary heart disease prevalence was found, but the prevalence of definite myocardial infarction, established on the basis of electrocardiographic criteria alone, was significantly higher in the 45 to 54-yr urban group. Follow-up of this population to study incidence of disease and the influence of the various factors on the development of the disease is in progress. (Author summary modified)

17736 APTIC NO. 35181

Giles, Ralph E., Martin P. Finkel, and Ronnie Leeds

THE PRODUCTION OF AN EMPHYSEMA-LIKE CONDITION IN RATS BY THE ADMINISTRATION OF PAPAIN AEROSOL (34750). *Proc. Soc. Exp. Biol. Med., 134(1):157-162, May 1970. 7 refs.*

Utilization of the proteolytic enzyme papain to produce an experimental emphysema-like state in laboratory animals may be of pertinent value in light of recent evidence that a deficiency of a1-antitrypsin factor is associated with primary panlobular emphysema in man. Sprague-Dawley rats were subjected to various treatment schedules. A 3% solution of papain in water was delivered by four nebulizers attached to the back of a closed Plexiglas chamber containing the rats. In a second treatment schedule, a miniature laryngoscope was used to give an injection of either papain or saline once a week for 4 weeks. At the end of the 4-week period, the functional residual capacity (FRC) was determined. Both male and female rats receiving aerosol papain exhibited increases in FRC, FRC-kg, and air spaces which were significantly different from untreated controls. Broken alveoli forming large confluent alveolar sacs appear in the lung treated with papain aerosol. While increases in the mean values for FRC and FRC-kg

parameters were observed in the intratracheal administered papain group, only the FRC value in the females was significantly different from untreated controls.

17737 APTIC NO. 35767

Giuliano, G., G. Cicchella, and A. Iannaccone

INVESTIGATION OF MERCURY IN THE CEREBROSPINAL FLUID OF SUBJECTS EXPOSED TO CHRONIC OCCUPATIONAL HYDRARGYRISM HAZARDS. *(Ricerca del mercurio nel liquor di soggetti esposti al rischio di idrargirismo cronico professionale). Text in Italian. Lav. Um., 23(4):97-111, April 1971. 31 refs.*

Mercury was investigated in simultaneously collected cerebrospinal fluid, blood, and urine samples from 20 patients 23-67 years old. Eighteen of these patients had been working in a felt hat factory for 5.0 29.0 years and thus had been exposed to inorganic mercury compounds. Two of these patients had been exposed to metallic mercury in a mercury extracting and refining plant. Cerebrospinal fluid mercury ranged from undetectable to 8.5% microgram amounts; blood mercury ranged between 7.5 and 57.5% micrograms, and urinary mercury levels varied from 12.0 to 520% micrograms. Five patients had negative results and 15 had minor or medium tremor symptoms upon neurological examination. Psychiatric examination revealed six normal cases, six cases with neurasthenic psychoneurosis, and six cases with anxiety-associated psychoneurosis. Electroencephalographs were normal in 10 cases, close to normal in five, and pathological in five patients. Correlation between cerebrospinal fluid, blood, and urinary mercury appeared to be statistically significant. A certain relationship between the presence of mercury in the cerebrospinal fluid and the neuropsychical condition was also ascertained.

17738 APTIC NO. 35668

Goldmsith, John R. and Margaret Deane

OUTDOOR WORKERS IN THE UNITED STATES AND EUROPE. *Milbank Mem. Fund. Quart., vol. 43:107-116, April 1965. 6 refs.*

Studies of chronic respiratory disease were carried out in Los Angeles and San Francisco, using employees doing similar work for a telephone company. Efforts were made to facilitate the comparison of these studies with others from the east coast of the United States and from Europe, particularly Great Britain, to examine any differences in rates as a possible indication of air pollution effects and to see whether the effects of age and smoking on respiratory function and other variables differed meaningfully among the different locations. The questionnaires used and the steps taken to encourage comparability are discussed. Results showed no marked differences among the U. S. east and west coast groups in frequency of respiratory conditions or in pulmonary function tests. In the older group respiratory symptoms were more frequent in the Los Angeles than in the San Francisco populations. Mean carbon monoxide concentration in expired air was a valid indicator of the amount of smoking.

17739 APTIC NO. 35968

Grosser, P.-J., Ch. Stark, J. Jech, and H. Mehlhorn

VITAL CAPACITY AND FORCED INSPIRATION TEST IN SCHOOL CHILDREN OF THE FOURTH AND FIFTH GRADE FROM AREAS WITH DIFFERENT AIR HYGIENE CONDITIONS. *(Vitalkapacitaet und Atemstosstest bei Schulkindern der 4. bzw. 5. Klasse in lufthygienisch unterschiedlich belasteten Gebieten). Text in German. Z. Erkrankungen Atmungsorgane, 134(2):255-265, 1971. 52 refs.*

Pulmonary function tests were carried out in more than 250 match paired children of the fourth and fifth grade from a polluted area (city of Bitterfeld) and a non-polluted area (the Pankow district of Berlin). Data on age, height, weight, chest circumference, vital capacity, and forced inspiration are tabulated. Certain differences that appear statistically significant could be attributed to different environmental conditions. However, further studies to obtain more information on the effects of air pollution on pulmonary function in children are planned.

17740 APTIC NO. 35811

Hall, Stephen K.

POLLUTION AND POISONING. *Environ. Sci. Technol., 6(1):31-35, Jan. 1972. 5 refs.*

Atmospheric levels resulting from the continued use of lead are far above those that would exist naturally and can have grave consequences on human health. Available data indicate that combustion of leaded gasoline is the major source of atmospheric lead in urban areas. Other sources are manufacturing, pesticides, incineration of refuse, and combustion of coal. In many communities, the atmospheric lead contribution to the body approaches or even surpasses the contribution made by dietary intake. The atmospheric level varies directly with volume of traffic and size of a community, and is correlated with the amount of lead in surface water supplies. In Los Angeles, with a population of more than 2.5 million, the mean atmospheric concentration is five microgram/cu m air. Other urban communties with a population greater than two million have values of about 2.5 microgram. Communities smaller than a million and communities of less than 100,000 have means of two microgram and 1.7 microgram, respectively. The mean is rising by as much as five percent a year. High body lead levels can affect the blood, kidneys, and nervous system. Repeated ingestion of lead paint by children can culminate in convulsions and coma and sometimes sudden death. Any further increase of lead in environment will result in further concentration in some food chains, leading ultimately to toxic doses for man and other important organisms.

17741 APTIC NO. 35568

Hickman, J. R.

LEAD POISONING: POTTERY GLAZES, AN OFTEN-IGNORED HAZARD. *Preprint, Canada Safety Council, Fredericton (New Brunswick), 13p., 1970. 18 refs. (Presented at the Canada Safety Council, Fredericton, New Brunswick, May 26, 1970.)*

Lead poisoning due to the ingestion of foods stored and contaminated is glazed pottery is reviewed. Conditions favoring the dissolution of lead, the subsequent contamination of food, the constituents of pottery glazes, firing techniques to control lead dissolution, and alternatives are examined. Occupational exposure of potters inhaling lead-containing dusts is discussed with respect to preventive measures.

17742 APTIC NO. 35600

Hoffman, Erwin F. and Alexander G. Gilliam

LUNG CANCER MORTALITY. GEOGRAPHIC DISTRIBUTION IN THE UNITED STATES FOR 1948-1949. *Public Health Rept. (U. S.), 69(11):1033-1042, Nov. 1954. 6 refs.*

Age, race, sex, and residence (urban-rural) specific rates for mortality attributed to cancer of the lung are given for the United States for an average of the years 1948-49. In all age, race and sex components, the rate is greater for urban residents than for rural residents. The total rates for the white population are considerably higher than those for nonwhite, but the difference is more pronounced among males than among females. The overall excess among the white population is due to greatly excessive rates among older persons, since in some of the younger age groups rates are actually higher among the nonwhite population. This age differential in rates does not appear to be consistent with the view that the lower total mortality for the nonwhite population is due to inadequate diagnostic facilities. State rates in 1948-49 are compared by means of standardized mortality ratios. These ratios standardized for age, race, sex, and residence (urban-rural) and expressed as a percentage of the United States total rate. The influence of residence and race components of each State population on its total ratio is also demonstrated. It is not possible from data now available to determine whether the observed geographic distribution is due to environmental, occupational, economic, diagnostic, or other factors. The increase in lung cancer mortality between 1930-32 and 1948-49 is also shown for the United States and each State. The increase among the nonwhite population was greater than in the white, but this may be due largely to a greater relative increase in urbanization and its concomitants among the nonwhite population during this period. (Author summary)

17743 APTIC NO. 35973

Hollenbach, K., E. Kersten, K. Patzelt, and G. Schwesinger

INVESTIGATION ABOUT THE EFFECTS OF A SINGLE INTRATRACHEAL APPLICATION OF APATITE-NEPHELINE AND APATITE-CONCENTRATE DUST TO RAT LUNGS. *(Untersuchungen zur fibrogenen Wirksamkeit von Apatitnephelin- und Apatitkonzentrat-Staub in Rattenlungen nach einmaliger intratrechealer Applikation). Text in German. Int. Arch. Arbeitsmed., vol. 28:271-282, 1971. 32 refs.*

Suspended in one ml of physiological saline solution, 50 mg of apatite (calcium phosphate) concentrate and apatite-nepheline (apatite ore) were applied intratracheally once to female albino rats. The histological examination of the macroscopically affected parts of the lungs and the paratracheal lymph nodules was performed 26, 39, and 52 weeks later, following sacrifice of the animals. An histocytical and fibrocytial formation of nodules in the lungs was observed in all the 52-week animals, with a desquamation of the epithelia and metaplastic modifications of the plate epithelium of the bronchial mucous membrane. Application of apatite-concentrate resulted in a lymphoplasmacellular reaction with subsequent leucocytical infiltration. In both dust samples the examined lymph nodules showed the symptoms of a chronic lymphadenitis. (Author summary modified)

17744 APTIC NO. 35153

Ii-izumi, Osamu and Yutaka Mori

HISTOPATHOLOGICAL STUDIES OF PARANASAL SINUSES OF GERM-FREE GUINEA PIG EXPOSED TO SULFUR DIOXIDE GAS (SO2). *(Aryusan gasu (SO2) bakuro mukin shiiku morumotto no hara fukubiku no byori soshikigaku teki kenkyu). Text in Japanese. Nihon Jibi Inkoka Gakkai Kaiho (Jap. J. Nephrol.), 74(9):1358-1362, Sept. 1971.*

Germ free guinea pigs were used for an experiment to study the effect of sulfur dioxide on the upper respiratory tract, especially paranasal sinuses. Ten germ-free guinea pigs were continuously exposed to 40 ppm of SO2 for two to 18 days from 10 days after birth. Their pathology of paransal sinuses was compared with that of 11 germ-free pigs reared under conventional conditions. Mucous membranes of paranasal sinuses of the guinea pigs not exposed to SO2 were in a static or silent state, which proved that no reaction occurred against stimulus. Since pus was seen in all the nasal sinuses of guinea pigs exposed to SO2, and desquamation of epithelium was observed in the mucous membrane of the respiratory tract, the mucous membrane probably undergoes necrosis from higher concentrations of SO2. Hyperemia and congestion of blood vessels and neutrophils were observed which proved acute inflammation. Hyperplasia of mucous membrane, increase of inmature cells, and infiltration under mucous membrane were not seen. A long-term experiment under low concentrations is necessary for a more accurate air pollution study. Changes were found in the respiratory tract; no difference was seen in the paranasal sinuses of the two groups of guinea pigs. Although the mucous membrane of human sinuses is anatomically different form that of guinea pigs, SO2 would probably be toxic to human bodies, judging from the fact that acute inflammation is caused by SO2 and that patients with paranasal sinuses diseases frequently come from contaminated districts.

17745 APTIC NO. 35233

Jandl, James H., John K. Inman, Richard L. Simmons, and David W. Allen

TRANSFER OF IRON FROM SERUM IRON-BINDING PROTEIN TO HUMAN RETICULOCYTES. *J. Clin. Invest., vol. 38:161-185, 1959. 66 refs.*

The interaction between IBP (an iron-binding protein, beta-1 globulin) and immature red cells which represents a physiologic transfer system was observed. Iron transfer is dependent upon the extent of saturation of IBP. A competition exists for iron between IBP and iron-binding receptors on the reticulocyte membrane. These cellular receptors are destroyed by certain proteolytic enzymes. Iron appears to be directly transferred to these receptors without existing in a free form; iron once bound to reticulocyte membranes is not exchangeable with free iron and cannot be eluted with high concentrations of IBP or of ethylene-diaminetetraacetic acid (EDTA). The transfer of IBP-iron to immature red cells is related to metabolic energy-producing processes. Thus, it is accelerated by glucose and oxygen and is diminished or blocked by low concentrations of metabolic inhibitors, by nonphysiologic temperatures and hemolysis. The uptake of iron is not primarily linked to heme synthesis. Appropriate concentrations of lead(41) blocked iron incorporation into heme by reticulocytes without reducing iron transfer, thus causing a pile-up of iron on the cell membranes. Although free iron is usually bound equally by mature and immature red cells, free cobalt is more avidly bound by the immature cells. Trivalent cobalt, which forms colored chelates with purified IBP, as does iron, also is bound by the IBP of whole plasma. Cobalt bound to IBP can, to a limited extent, be transferred preferentially to reticulocytes. (Author summary modified)

17746 APTIC NO. 35218

Joyce, C. R. B., Henrietta Moore, and M. Weatherall

THE EFFECTS OF LEAD, MERCURY, AND GOLD ON THE POTASSIUM TURNOVER OF RABBIT BLOOD CELLS. *Brit. J. Pharmacol., vol. 9:463-470, 1954. 20 refs.*

The movements of potassium between rabbit erythrocytes and their environment were examined in the presence and absence of the chlorides of lead, mercury, and gold. Changes were observed in the potassium content and in the entry of K(42) into rabbit blood cells poisoned with lead chloride, mercuric chloride, and gold chloride at 37 and 7 deg. All three metals caused loss of K from the cells, and later (except lead chloride at 7 deg) caused hemolysis. Lead chloride greatly accelerated the entry of K (42) into the cells, at the same time as net losses of K were occurring. These changes occurred both at 37 and 7 deg, but were followed by hemolysis only at 37 deg. Mercuric chloride mainly caused loss of K from the cells, but with large losses and incipient hemolysis the K (42) entry was accelerated. Gold chloride acted less rapidly than the other two substances, and then produced changes intermediate between their effects.

17747 APTIC NO. 35071

Kimura, Kikuzi

EXPERIMENTAL STUDIES ON THE AEROSOL DEPOSITION IN THE HUMAN RESPIRATORY SYSTEM (REP. 2). *(Earozoru no kokyu kido chinchaku ni kansuru kenkyu (dainiho)). Text in Japanese. Rodo Kagaku (J. Sci. Labour, Tokyo, 47(11):668-675, Nov. 1971. 6 refs.*

Previous experiments indicated that the aerosol deposition rate in the human respiratory system is related to the tidal volume, and that the quantity of aerosol deposited during exercise differs from the amount deposited during resting. These findings have been confirmed, and regional differences in the deposition rate were investigated. The respiratory tract was divided into three regions according to carbon dioxide concentration and the volume of expired air: the upper respiratory tract, the median respiratory tract, and pulmonary space. The deposition rate in the pulmonary space increased with an increase in tidal volume, which is generally related to the intensity of physical exercise. The aerosol deposition rate in the respiratory tract was closely related to the respiration condition. The amount of aerosols deposited was also related to the intensity of physical exercise. Particles deposited in the upper and median respiratory tract may be expelled by motion of the cilia, which becomes much more difficult in the pulmonary space. With regard to the pathogenesis of pneumoconiosis, attention should be paid to the fact that aerosol deposition in pulmonary space is influenced by the intensity of physical exercise. (Author abstract modified)

17748 APTIC NO. 35147

Kodama, Buichi

ON AIR POLLUTION AND CHRONIC OBSTRUCTIVE DISEASES OF INFANTS. *(Taikiosen to shoni no mansei heisokusei shikkan ni tsuite). Text in Japanese. In: A study of the administration method of medical care for sufferers from public nuisance in Yokkaichi City. Committee of Mie Prefectural Medical Insurance on Public Nuisance, p. 81-90, March 1970.*

The children suffering from chronic bronchial impairments were classified into groups from polluted areas and unpolluted areas. Both chronic bronchitis and asthmatic bronchitis were observed in the group from a polluted area, especially among males. Chronic bronchitis and asthmatic bronchitis were aggravated even during the summer in the group from the polluted area. The convalescent rate tended to be lower in the polluted area group. No significant difference was statistically observed between the two groups with bronchial asthma as to the season of asthmatic attacks, antigen-reaction, the age of the first attack, positivity rate of heredity, individuality of allergic disease, ventilating functions, and convalescent rate. The relation between the days of bronchial asthma attacks and sulfur dioxide concentration is now being examined. Some correlation occurs between the attacks and the peak of SO2 concentration, on the other hand, many cases of attack are also observed in the group from the unpolluted area.

17749 APTIC NO. 35347

Kuschner, Marvin and Sidney Laskin

EXPERIMENTAL MODELS IN ENVIRONMENTAL CARCINOGENESIS. *Am. J. Pathol., 64(1):183-191, July 1971. 13 refs. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, Atlantic City, N. J., April 15, 1970.)*

Exposure models in pulmonary carcinogenesis are examined with respect to cigarette smoking, exposure to sulfur dioxide, combination effects, dose respones, morphogenesis, and pathogenesis. Model systems are useful in assembling significant combinations of materials to demonstrate the multifactorial etiology of a tumor. Experimental models for the investigation of metabolic pathways and the identification of proximate carcinogens are discussed. Basing on epidemiological data, studies in environmental carcinogenesis have the potentiality for immediate reduction in cancer morbidity and mortality.

17750 APTIC NO. 35868

Luhanova, Zdenka

THE INFLUENCE OF AIR POLLUTION OF THE NUTRITIONAL CONDITION OF CHILDREN. *(Einfluss der luftverunreinigung auf den Ernaehrungszustand der Kinder). Text in German. Protectio Vitae, 16(5):203-204, Oct. 1971. 5 refs.*

The entire physical condition, the nutritional condition, and body development of children from polluted and non-polluted areas was compared. The nine to ten year-olds ingested approximately the same food. The hemoglobin was measured photometrically, the regeneration of the epithelium in the mouth was cytologically determined. Also, the Whitehead Test (chromatographic separation of amino acids on paper) was performed. Protein saturation was determined. All indicators show that the children in the polluted area were less well nourished than those in the control group, even though they ingested the same food. The organism makes less use of biologically valuable nutrients in polluted atmosphere than in clean atmosphere. The average values obtained by the Whitehead Test were 1.17 for the unpolluted area and 1.28 for the polluted area. The regeneration of the epithelium in the mouth was 80.5% in the unpolluted area, 72.5% in the polluted area; the hemglobin values were 90% in the unpolluted area and 85.5% in the polluted area.

17751 APTIC NO. 35602

Mancuso, Thomas F., Elizabeth M. MacFarlane, aand John D. Porterfield

THE DISTRIBUTION OF CANCER MORTALITY IN OHIO. *Am. J. Public Health, vol. 45:58-70, Jan. 1955. 16 refs. (Presented at the American Public Health Association, Annual Meeting, 82nd, Buffalo, N. Y., Oct. 12, 1954.)*

An analysis of death certificate accuracy was made determining the confirmation of diagnosis of 990 male deaths due to tumors of the central nervous system which occurred in 1944-1952; 80.2% were assuredly primary. A study of the geographical distribution of twelve cancer sites within the State of Ohio revealed there were differences in some sites but not in all sites. It was also observed that the counties which showed excesses in cancer mortality for the most part were counties with large urban populations. The study of the urban-rural relationship revealed that for most cancer sites, higher mortality ratios occurred in the metropolitan counties than in the rural areas for lung, esophagus, buccal cavity and pharnyx, larynx, tumors of the central nervous system, and bladder. There was no difference between the metropolitan and rural counties among the following cancer sites: stomach, pancreas, lymphatic and hematopoietic tissues, leukemias, and prostate. For the eight metropolitan counties in Ohio, a comparison of the white native and foreign born males, ages 25-64, revealed a significant excess in lung cancer mortality among the foreign born. In Cuyahoga County the characteristics found to be associated with an excess of lung cancer mortality were foreign birth, low economic level, and low education level. Results indicate that state health departments should use death certificate data on the epidemiologic study of cancer and other noncommunicable diseases. (Author summary)

17752 APTIC NO. 35620

Marver, H. S., D. P. Tschudy, M. G. Perlroth, A. Collins, and G. Hunter, Jr.

THE DETERMINATION OF AMINOKETONES IN BIOLOGICAL FLUIDS. *Anal. Biochem., vol. 14:53-60, 1966. 27 refs.*

A new chromatographic procedure is described for determination of aminoacetone and delta-aminolevulinic acid (after conversion to pyrroles) in tissues and urine following their separation from porphobilinogen. The method for measurement of both porphobilinogen and aminoketones involves only two chromatographic procedures, both utilizing Dowex-1 acetate resin. It permits concentration of pyrroles derived from both aminoketones, providing for the determination of as little as 20 millimicromole quantities of these substances. Reproducibility and recoveries are excellent over a wide range of concentrations. Aminoacetone pyrrole is retained by the resin primarily by adsorption; delta-aminolevulinic acid pyrrole is bound by an ionic mechanism. Aminoacetone constitutes a significant portion of the aminoketones in nonporphyric urines. The administration of relatively large doses of threonine resulted in an increased urinary excretion of aminoacetone. (Author summary modified)

17753 APTIC NO. 35074

Matsuo, Kouichi, Susumu Sugimoto, Tsune Nakayama, and Akimasa Nishimura

SURVEY AND STUDY OF VARIOUS RESPIRATORY DISEASES WHICH WERE EXAMINED BY THE MEMBERS OF THE YOKKAICHI MEDICAL ASSOCIATION AND WERE THOUGHT TO HAVE BEEN INFLUENCED BY AIR POLLUTION. *(Yokkaichi ishikaiin no shinryo shita taikiosen no eikyo no aruto omowareru kakushu kokyuki shikkan no chosa kenkyu). In: Studies of the method for controlling respiratory diseases due to air pollution. Text in Japanese. Yokkaichi City Medical Assoc. (Japan), p. 85-114, March 1969.*

Patients who visited medical organizations belonging to the Yokkaichi Medical Association and five medical organizations in Kuwana City in May and August 1968 and January 1969 with bronchial asthma, chronic bronchitis, pulmonary emphysema, and asthma and bronchitis were studied. Their names, ages, addresses, occupations, insurance coverage, whether or not the patient is recognized by the environmental pollution relief law, and whether the patient is an inpatient or an outpatient were invesgiated. Actual numbers of outpatients and inpatients who visited during this period were also reported. No particular diagnostic criterion was established for each disease except chronic bronchitis. In Yokkaichi City as a whole, the number of patients for each disease has increased, particularly remarkably in Jaunary 1969, followed by May 1968. The number of patient cards classified by their addresses was the largest in Shiohama and the old city. Comparison of the incidence rate of patients in the same medical organization between 1967 and 1968 revealed a general decrease but an increase in the suburbs. The age structure for each disease was characterized by an increase in patients over 55 years old and under 10 in May 1968 and January 1969 and a nearly identical trend in August 1968 and the year 1967. Chronic bronchitis was frequently seen among the patients over 55 for each month and asthma and bronchitis were seen in those under 10 for each month. Pulmonary emphysema hardly showed any change from 1967.

17754 APTIC NO. 36003

Menzel, Daniel B.

OXIDATION OF BIOLOGICALLY ACTIVE REDUCING SUBSTANCES BY OZONE. *Arch. Environ. Health, vol. 23:149-153, Aug. 1971. 14 refs.*

Cysteine, reduced glutathione, thioglycolic acid, reduced nicotinamide adenine dinucleotide, and nicotinamide adenine dinucleotide phosphate are readily oxidized by ozone. When glutathione is oxidized, the product is not reducible by the biological system of glutathione reductase and NADPH. NADH and NADPH are biologically active as coenzymes, however, after oxidation. Sulfhydryl enzymes, papain, and glyceraldehyde 3-phosphate dehydrogenase are also inactivated by ozone even in the presence of cysteine. The inactive form of the enzymes is only partially reactivated by cysteine. Other sulfhydryl reagents provide only partial protection of papain against ozone. Selenocysteine in combination with cysteine is a highly effective protector. These data suggest that ozone may act by oxidation of sulfhydryl compounds, and especially sulfhydryl enzymes, to higher oxidation states than the disulfide which is not reducible by the reductases available in cells. Seleno compounds may be important cellular protectors. (Author abstract)

17755 APTIC NO. 35453

Molokhia, Mohamed M. and Hamilton Smith

TRACE ELEMENTS IN THE LUNG. *Arch. Environ. Health, vol. 15:745-750, Dec. 1967. 15 refs.*

The concentrations of three essential (copper, manganese, zinc) and four nonessential (antimony, arsenic, cadmium, mercury) trace elements in the lungs of a random health population were surveyed and show the characteristic modes of distribution. The distribution of trace elements throughout the lungs themselves are also presented. These results show the tendency of nonessential trace elements to accumulate in higher concentrations in the lung parenchyma than in the surrounding unexposed tissue. That the source of this accumulated material is probably airborne dust is supported by the fact that the apex of the lung tends to be more contaminated than the base. The lower concentrations of trace elements in cancerous lung tissue than in healthy lung may be in part be due to the shorter exposure time of the neoplasm to atmospheric dust. The picture within the nonessential element group tends to vary. This is shown by the low lymphnode concentrations of mercury and cadmium when compared with antimony and arsenic levels and may be due to the varying ease of absorption and removal of particulate contaminants by the normal body processes. The situation with respect to essential trace elements is more obscure, perhaps due to a concentration control control mechanism combined with varying ease of absorption. (Author summary modified)

17756 APTIC NO. 35462

Moncrieff, A. A., O. P. Koumides, Barbara E. Clayton, A. D. Patrick, A. G. C. Renwick, and G. E. Roberts

LEAD POISONING IN CHILDREN. *Arch. Disease Childhood (London), vol. 39:1-13, 1964. 29 refs.*

Blood lead levels were determined in 80 normal children, 122 mentally retarded children, 40 children with encephalitis, and 52 children with severe anemia or pica. Blood pyruvate levels were also determined in a number of patients since thiol groups essential for pyruvate oxidation may be inactivated by lead. All but two of the normal children had lead levels of 36 microgram or less per 100 ml blood, and this value was taken as the upper limit of normal. Levels greater than 36 microgram were found in 45% of the mentally retarded children, 30% of the children with encephalitis, and 54% of the children with severe anemia or pica. Results for the pyruvate determinations indicated that lead levels of only 40-60 microgram may be associated with raised pyruvate levels, i.e., with evidence of an abnormality in the citric acid cycle. Additional studies involved the effect of chelating agents on clinical progress in 20 patients with lead poisoning. Pencillamine produced a rise in urinary lead excretion comparable with intramuscular EDTA. It has the great advantage of oral administration and appears to be adequate treatment for milder cases of lead toxicity. Since intravenous EDTA produces maximum excretion rates, it use is indicated in severe poisoning.

17757 APTIC NO. 35217

Morgan, Jean M.

A SIMPLIFIED SCREENING TEST FOR EXPOSURE TO LEAD. *Southern Med. J., vol. 60:435-438, April 1967. 20 refs.*

The use of calcium disodium ethylenediaminetetraacetate to demonstrate excessive storage of lead in humans was discussed. Tests were attempted on all patients admitted to a 60 bed general hospital provided they were able to take oral medicine. Two grams of EDTA were administered orally and the overnight urine specimen (12 hr) was obtained for lead assay. Blood and urinary lead was determined by the dithizone method. Urinary delta-aminolevulinic acid was determined by the method of Mauzerall and Granick. One hundred and thirty-nine consecutive admissions over a period of six weeks were observed. Thirty-eight percent acknowledged or were known to have used illegal alcohol at some time. Ninety-eight patients (70%) received the oral EDTA. Of the 98 persons tested, 67 did not have evidence of excessive exposure to lead and 31 individuals had both history of exposure to illegal alcohol and had urinary excretion of lead greater than 0.5 mg/l. The EDTA test is simple, safe, and effective in detecting persons who were subjected to excessive storage of lead. A very significant portion of men over 35 years of age in the South, particularly among Negroes, demonstrate excessive storage of lead as a result of previous regular use of illegally produced alcohol. Most of these persons do not have clinically recognized lead poisoning. Further studies are needed to elucidate the long-term consequences of this excess.

17758 APTIC NO. 35360

Nasr, Ahmed Nasr Mohamed

CELLULAR BIOCHEMICAL RESPONSE TO OZONE INHALATION: AN EXPERIMENTAL METHOD FOR THE STUDY OF THE TOXICITY OF AIR POLLUTANTS. *Michigan Univ., Ann Arbor, Dept. of Industrial Health. Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1969, 86p. 75 refs.*

An investigation was undertaken to develop an experimental model for the study of the toxicity of air pollutants in terms of biochemical pathology, and to elucidate some aspects of the basic mechanism of ozone toxicity. Epithelial cell suspensions were prepared from rat trachea by the brush-technique. The ratio of reduced to oxidized nicotinamide adenine dinucleotide phosphate was determined in the tracheal epithelium of normal rats and rats that had inhaled ozone at a high concentration. The oxidized (NADP+) and reduced (NADPH) forms of NADP were assayed by enzymatic cycling. NADP plays a central role in cell respiration. Together with its unphosphorylated form, nicotinamide adenine dinucleotide, they are, for most metabolites, the first electron-acceptors in the electron-transfer chain of enzymes and cofactors. The ratio NADPH/NADP+ in the tracheal epithelium of normal rats was 1.31 plus or minus 0.07. This relative preponderance of NADPH over NADP+ is in agreement with the findings of other investigators in the liver and brain of the same animal. The ratio of NADPH/NADP+ in tracheal epithelia removed from rats immediately following inhalation of ozone at a concentration of 33 ppm/hour is not significantly different from the ratio in control animals, which was 1.37 plus or minus 0.09. Ozone was found to destroy NADPH, but not NADP+, in vitro. The extent of degradation of NADPH was directly proportional to the amount of ozone involved in the reaction. (Author abstract modified)

17759 APTIC NO. 35110

Okamoto, Yoshimichi and Youichi Nakamura

SURVEY FOR DRUGS PURCHASED BY THE PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AT HIS OWN EXPENSE. *(Mansei heisokusei haissikan kanja ni okeru jihi konyu yakuzai chosa ni tsuite). Text in Japanese. In: Studies of the method for controlling respiratory diseases due to air pollution. Yokkaichi City Medical Assoc. (Japan), p. 76-84, March 1969.*

Drugs purchased by patients with chronic obstructive pulmonary disease at their own expense without the direction of a doctor from January 1, 1968 to June 30, 1968 were surveyed. A questionnaire and interview chart were sent to members of the Yokkaichi Medical Association, and the interview was performed at the examination of patients. Of the 2800 survey cards 331 replies were received. Of those the number of users of drugs purchased at their own expense was 121. This generally occurred among males older than 50. One half were patients covered by the national health insurance. Most of these patients were those recognized by the environmental pollution relief law. Inhalants and vitamins were frequently used. About 81% of the patients using drugs purchased at their own expense had bronchial asthma.

17760 APTIC NO. 35506

Oshima, Hidehiko, Masayuki Imai, and Fukiko Kawagishi

PATHOLOGICAL STUDY CONCERNING RESPIRATORY PHYSIOLOGY AND SEROLOGICAL STUDY OF VICTIMS OF POLLUTIONS. (PART 2) OBSTRUCTIVE RESPIRATORY DISEASES DUE TO AIR POLLUTION AND CONCENTRATION OF BLOOD PLASMA HISTAMINE. *(Kogai kanja no kokyu seiribyotaigaku teki kenkyu narabini kesseigaku teki kenkyu. (Sono 2) Taiki osen ni yoru heisokusei kokyuki shikkah to kessho histamin nodo). Text in Japanese. In: A study of the administration method of medical care for sufferers from public nuisance in Yokkaichi City. Committee of Mie Prefectural Medical Insurance on Public Nuisance (Japan), p. 79-80, March 1970.*

Blood plasma histamine was estimated for 10 normal people and 30 approved victims of pollution (nine chronic bronchitis patients and 21 bronchial asthma patients). Estimation of blood plasma histamine was made by means of a fluorescent photometer. The estimated value of 10 normal people was 1.0 6.5, averaging 3.1 + or 1.7 micrograms/l; that of nine chronic bronchitis patients was 2.5 13.0, averaging 7.8 + or - 2.9 micrograms/l; and that of 21 bronchial asthma patients was 2.7 23.5, averaging 10.5 + or - 5.0 micrograms/l. Higher concentration of blood plasma histamine was observed among the patients with chronic bronchitis and bronchial asthma than among the normal, and a one percent danger rate was observed between the normal people and the patients. But no significant difference was observed between the concentration of blood plasma histamine in chronic bronchitis and that of bronchial asthma, although the latter was slightly higher than the former in the value.

17761 APTIC NO. 35331

Perov, O. V.

THE CYTOTOXICITY OF INHALED HYDROCARBONS AEROSOL OF THE HEAVY COAL FRACTION. *(Tsitotoksichnost aerozolya uglevodorodov tyazheloy kamennougolnoy fraktsii pri vdykhanii). Text in Russian. Gigiena i Sanit., no 9:28-31, 1971. 15 refs.*

The action of inhaled hydrocarbons from the heavy fraction of bituminous coal on lung cells was studied in white rats. Animals were kept in exposure chambers containing 100 mg/cu m of anthracene oil aerosols. Daily exposure lasted six hours (six days a week) and the experiment lasted two months. Severe inhibition of the detoxicating lung cell membrane mechanisms was observed in the treated animals. This alteration was accompanied by lung parenchymal damage as well as by cell proliferation and increasing gamma-metachromasia of the lung tissue preparations. Regeneration of functional activity of the lung tissue occurred slowly. Intracellular catalytic activities returned to normal one month after cessation of exposure to inhalation of anthracene containing aerosols. However, regeneration occurred only to a certain extent. Renewed exposure to the agent produced lung damage at a faster rate than that observed during the first time exposure. Decreased mobilization of adaptation mechanisms along with an increase in parenchymal cell damage were observed. Concentrations reaching 100 mg/cu m of similar compounds in the environmental air of emission sources should not be admitted.

17762 APTIC NO. 35588

Reid, D. D. and A. S. Fairbairn

THE NATURAL HISTORY OF CHRONIC BRONCHITIS. *Lancet, vol. 1:1147-1152, May 31, 1958. 10 refs.*

The sickness-absence records of postmen who were permanently disabled by chronic bronchitis or who died from this cause while still in service were compared with those of other postmen of the same age still actively employed in the same area and with the same length of service. The incidence of all forms of respiratory disease at all ages from 20 to 59 was contrasted in the two groups. The pattern of disease, including the incidence of serious pneumonia, pleurisy, and circulatory disturbances, was also compared in groups on bronchitic postmen who worked on four sections of the country graded according to presumptive air pollution based on fog frequency. After the age of 45, the bronchitics became rapidly worse with 8-10 times as many attacks of pneumonia, pleurisy, and asthma as their controls. Circulatory disorders were particularly excessive among bronchitics who died either while still in service or within seven years after invaliding. Bronchitic invalids had more disability from peptic ulcer and more deaths from coronary disease and lung cancer than the population at large. Results indicate that there are important differences, probably due to variations in local air pollution levels, in the character as well as in the frequency of bronchitic disease in different parts of the country. (Author summary modified)

17763 APTIC NO. 35670

Sadilova, M. S., T. S. Egorova, and V. L. Vishnevskiy

REFLEX REACTIONS OF AN ORGANISM UNDER THE EFFECT OF HF, NAF AND ALF3. *(Nekotoryye reflektornyye reaktsii organizma pri deystvii HF, NaF i AlF3). Text in Russian. Flyuoroz Ego Protil., Mater. Simp., 1966, p. 100-104. 2 refs.*

The effect of hydrogen fluoride and its salts in the atmosphere on the sensitivity of the human eye was studied using an adaptometer. Participants in the experiment were placed in a completely darkened room. After 15 minutes of adaptation to darkness, air containing various concentrations of HF or its salts was introduced into the room. A diaphragm over the light spot kept open until noticed by the subject. Results are expressed in optical density. An increased sensitivity of eye to light was observed in the presence of studied materials in following concentrations: .03 mg/cu m HF, .05 mg/cu m NaF, and .3 mg/cu m AlF3. Thus, the maximum permissible concentrations recommended are, for HF, .02 mg/cu m; for NaF, .03 mg/cu m, and for AlF3, .2 mg/cu m.

17764 APTIC NO. 35279

Schepers, Gerrit W. H.

LUNG TUMORS OF PRIMATES AND RODENTS. PART II. INHALATION EXPERIMENTS. *Ind. Med. Surg., 40:23-31, May 1971.*

Pulmonary lesions, including lung cancer, were induced in monkeys, rabbits, rats, guinea pigs, and other animals following inhalation exposure to aluminum, quartz dust, silica, beryllium salt, and miscellaneous aerosols. The tumors developed in 10,765 experimental subjects; 4143 controls, matched for sex, age, and survival, showed no tumors. Beryllium salts were the principal carcinogens. Of 666 animals, 43% developed miscellaneous pulmonary lesions, 43% alveolar epithelialization, and 10% lung tumors. No lung tumors were observed in animals exposed to aluminum aerosols or submicron amorphous silica compounds. Quartz dust aerosols produced squamous carcinoma in two animals, while chrysotile plus beryllium sulfate aerosols produced lung tumors in two out of 30 rats. The incidence of pulmonary lesions was 84% for quartz dust, 67% for submicron silica compounds, and 42% for fibrous siliceous aerosols. The incidence of alveolar epithelialization was six percent for aluminum, 2.3% for quartz, 11% for submicron silica compounds, and four percent for fibrous siliceous aerosols. Forty-seven percent of the animals exposed to miscellaneous aerosols had lesions and five percent had epithelialization. Lung tumors were observed in less than 0.3% of the animals, and these were limited to those having inhalation of iron chloride, mineral oil, and oil smoke aerosols. The malignancy of lesions induced by beryllium salts was demonstrated by homotransplants through five generations. In most cases, dosage concentration influenced tumor production. As the dose was increased, the duration of exposure to produce tumors decreased.

17765 APTIC NO. 35055

Schroeder, Henry A.

METALS IN THE AIR. *Environment, 13(8):18-24, 29-32, Oct. 1971. 43 refs.*

Some metals sustain life, while others shorten it. Twenty-two metals have been found in polluted air in the United States, and three more are probably present. Lead, cadmium, nickel, and mercury represent potential or real public health hazards. The known consequences of breathing metallic compounds range from no ill effects to thyroid enlargement and lung cancer. Effects of lead include damage to the liver, kidney, brain, and central nervous and reproductive systems. Children are especially susceptible to lead poisoning. Cadmium contributes to high blood pressure and cardiovascular death rates. Nickel has caused cancer in animals and in man when inhaled as nickel carbonyl while skin inflammation occurs frequently in workers exposed to nickel in refineries and in electroplating plants. Alkyl mercury can cause irreversible brain damage and it is also toxic to the kidney. Berylliosis may develop in workers exposed to the highly toxic beryllium, and bismuth can cause kidney and liver damage in large doses. Antimony and tin were also found in several samples. Low-toxicity metals and trace metals are also listed, as well as the concentrations of the various metals found in both urban and non-urban areas.

17766 APTIC NO. 35741

Shephard, Roy J.

ATMOSPHERIC POLLUTION AND CHRONIC CHEST DISEASE. *Can. Family Physician, 17(11):39-44, Nov. 1971. 38 refs.*

In contrast to England, where the death rate from respiratory diseases remains relatively static, deaths from bronchitis, chronic bronchitis, and emphysema are increasing in Canada. Neither air pollution nor smoking habits can fully account for the difference in mortality between the two countries. Toronto is intrinsically about as dirty as other cities of comparable size, but other Canadian cities are substantially less polluted than their British counterparts. In view of the lag between intital insult and death, Canada may be witnessing the consequences of bad air pollution in the early 1950 s. Since the Clean Air Act of 1957, there has been remarkable overall improvement of air quality. Urban/rural comparisons suggest that high pollutant concentrations can double the prevalence of chronic bronchitis; however, the effect is much less obvious if comparisons are restricted to nonsmokers of comparable social status. Longitudinal surveys suggest a worsening of the bronchitic condition by an increase in ambient air pollution. The toxicity of smog is mentioned. Justification for air pollution control programs lies more in preventing damage to buildings than in a specific effect on human health. (Author abstract modified)

17767 APTIC NO. 35213

Smith, Roger P.

COBALT LYSIS AND METHEMOGLOBIN ACCUMULATION IN HUMAN ERYTHROCYTE SUSPENSIONS. *Proc. Soc. Exp. Biol. Med., 136(3):701-706, March 1971. 11 refs.*

Cobaltous chloride in concentrations up to 8.0 mM in human red cell suspensions in a Krebs-Ringer-bicarbonate-glucose media produced significant hemolysis under oxygen but not under nitrogen. Both 02 and cobalt have significant hemolysis effects and appear to greatly potentiate each other. Hemolysis favors methemoglobin accumulation in the extracellular fluid, but 02 has an additional effect in the opposite direction. By keeping the hemoglobin saturated, 02 tends to prevent auto-oxidation of the pigment to methemoglobin. Thus, methemoglobin accumulation in erythrocyte suspensions exposed to cobalt is a net result of several opposing effects, but no evidence was obtained to suggest that cobalt is a specific inhibitor of methemoglobin reductase. (Author summary)

17768 APTIC NO. 35587

Specter, Michael J. and Vincent F. Guinee

EPIDEMIOLOGY OF LEAD POISONING IN NEW YORK CITY - 1970. Preprint, American Public Health Assoc., New York, 10p., (Presented at the American Public Health Association Meeting, Houston, Tex., Oct. 26, 1970.)

In January 1970, in order to mount a more forceful and coordinated attack on the lead poisoning problem, the New York City Health Department created a new bureau, the Bureau of Lead Poisoning Control. The aims of the Bureau are to seek out children with significant lead exposure so that they can receive medical attention and theri home environment detoxified. the current definition of a case of lead poisoning is a child with a blood lead level equal to or greater than 60 micrograms. The prevalence of lead poisoning on New York city was first estimated by using data obtained from surveys of ghetto children in other cities. The incidence of lead poisoning and the percentage distrubution within New York City are indicated.

17769 APTIC NO. 35483

Stebbings, James H., Jr.

CHRONIC RESPIRATORY DISEASE AMONG NONSMOKERS IN HAGERSTOWN, MARYLAND. IV. EFFECTS OF URBAN RESIDENCE ON PULMONARY FUNCTION VALUES. *Environ. Res., 4(4):283-304, Oct. 1971. 40 refs. (Presented at the American Medical Association Air Pollution Medical Research Conference, 9th, Denver, Colo., July 22, 1968.)*

The effects of urban residence on prevalence of respiratory symptoms and on pulmonary function were investigated in male nonsmokers of Hagerstown, Md. Childhood residence in urban areas of over 50,000 population was positively related to the Peak Expiratory Flow Rate, the effect at age 21 was estimated at approximately +26 l/min. Residence in urban areas during adult life showed s significant nonlinear relationship to PEFR. Values increased during the first seven years of urban residence as an adult and then decreased; the effect at 30 years of urban residence after age 21 was estimated at -44 l/min. Results for the prevalence of cough and phlegm were consistent with the results for the PEFR. Social class and urban residence affected the relationship of the variance about the regession to the age of the respondents. (Author abstract modified)

17770 APTIC NO. 35469

Stocks, P.

ENDEMIOLOGY OF CANCER OF THE LUNG IN ENGLAND AND WALES. *Brit. J. Cancer (London), 6(2):99-111, June 1952. 12 refs. (Presented at the Society of Medical Officers of Health, England, May 9, 1952.)*

Tables of death rates attributed to lung cancer in England and Wales are analyzed. The apparent effect of the urban environment was more pronounced on men than women, between the ages 45 and 75. During the period 1946-1949 the deaths of males attributed to lung cancer in England and Wales averaged 9193 annually; of females, 1774. In 1950, deaths of males exceeded 10,250 and those of females were just short of 2000; and in 1951, the total reached 13,000. The numbers show no sign of levelling out, and were increasing by about 8% annually during 1946-1949. Comparative mortality ratios were calculated for all county boroughs for the years 1921-1939. Within the groups having less than 50,000 occupied dwellings there was a large range of mortalities for individual towns. There appeared to be a general tendency, however, for lung cancer mortality to increase with total number of chimneys until the dwellings exceed 100,000, after which some other factor must be involved.

17771 APTIC NO. 35603

Stocks, Percy and John M. Campbell

LUNG CANCER DEATH RATES AMONG NONSMOKERS AND PIPE AND CIGARETTE SMOKERS. AN EVALUATION IN RELATION TO AIR POLLUTION BY BENZPYRENE AND OTHER SUBSTANCES. *Brit. Med. J. (London), vol. 2:923-929, Oct. 15, 1955. 22 refs.*

Death rates from cancer of the lung and bronchus were calculated for men with different smoking habits living in a rural area of Wales, in a mixed area around Chester and Wrexham, and in Liverpool County Borough. The death rates were then related to measurements of benzpyrene and other substances present in the air at various places within those areas. The rural death rate increased proportionately to the number of cigarettes smoked weekly, and pipe smokers ranked with cigarette smokers about 25 a week. Liverpool rates exceeded the rural rates in every smoking category, but the urban/rural ratios fell progressively from about nine to one among nonsmokers to a small value approaching unity among heavy cigarette smokers. The absolute urban excess was the same in each smoking group, suggesting that an urban factor was added to the effects of smoking. Differences in smoking habits of the populations can account for only a small fraction of the contrast in total rates, and it is estimated that about half the Liverpool male lung cancer deaths arose from cigarette smoking and about three-quarters of the remaining half from a factor only slightly present in the rural areas. The concentration of smoke and 3,4-benzpyrene, other polycyclic hydrocarbons, and sulfur dioxide in the air increases with increasing urbanization, the benzpyrene figure in Liverpool being 8 to 11 times as great as in the rural localities examined. This ratio corresponds to the estimated mortality ratio among nonsmokers living in those areas. When the death rates were compared with the calculated total intake of benzpyrene derived from air plus that derived from the number of cigarettes smoked, the degree of correspondence suggested that benzpyrene might be the one agent involved. (Author summary modified)

17772 APTIC NO. 35704

Stoefen, Detlev

POLLUTION OF THE ATMOSPHERE WITH LEAD AND ITS EFFECT ON PUBLIC HEALTH. *(Die Verunreinigung der atmosphaerischen Luft mit Blei und ihr Einfluss auf die Gesundheit der Bevoelkerung). Text in German. Zentralbl. Arbeitsmed. Arbeitsschutz (Darmstadt), vol. 13:39-40, Feb. 1963.*

A storage battery factory in Germany was found to emit 5.7 kg lead into the atmosphere in 24 hours; a tin smeltery, 14.7 kg. The median daily lead concentration 500 to 700 m from the battery factory was four times the maximum permissible level of 0.0007 mg/cu m; 1500 m from the tin smeltery the atmospheric level was six times the maximum permissible level. High concentrations also prevail inside the plants. Persons exposed for long periods of time to a lead-polluted atmosphere manifested a higher than normal incidence of gastrointestinal, cardiovascular, and nervous diseases. Tissue studies on chickens have disclosed that lead is accumulated in the organism. Removal of lead from industrial emissions by electrofilters must therefore be strictly enforced. Cases of lead poisoning of children living in the vicinity of a lead smeltery are reported. In one case 100 micrograms/% lead were found in the blood and 520 micrograms/% coproporphyrin in the urine.

17773 APTIC NO. 35176

Sufrin, Mark

TO SCREEN OR NOT TO SCREEN FOR COPD. *Natl. Tuberc. Respirat Dis. Assoc., Bull., 56(9):11-13, Oct. 1970.*

Appropriate testing to detect the presence of early chronic obstructive pulmonary disease should be a component of periodic examinations by physicians, pre-employment health examinations, and multiphasic health examinations. Cigarettes, air pollution, and, in one form of emphysema, a genetic defect have been firmly linked to chronic obstructive pulmonary disease. Two techniques, with somewhat limited value, have been used to identify chronic obstructive pulmonary disease: relatively simple breathing tests with a spirometer, which reveals abnormal respiratory function; and a questionnaire that elicits the presence of highly suggestive symptoms, including persistent cough, sputum production, shortness of breath, and spasmodic wheezing. Chest x-rays on 70 mm film are often used to supplement the techniques. However, screening should not have priority over any program that could have more immediate effect in fighting chronic obstructive pulmonary disease.

17774 APTIC NO. 35109

Tateishi, Youji, Masaya Yamashita, Yukio Furuta, and Hideo Tamada

MANAGEMENT OF PATIENTS RECOGNIZED BY THE ENVIRONMENTAL POLLUTION RELIEF LAW DISEASE OF YOKKAICHI CITY ASSOCIATED WITH AIR POLLUTION. *(Yokkaichi-shi no nintei suru taikiosen kankei kanren shikkan ninteikanja no kanri). Text in Japanese. In: Studies of the method for controlling respiratory diseases due to air pollution. Yokkaichi City Medical Assoc. (Japan), p. 126-198, March 1969.*

The annual trend of the patients recognized by the environmental pollution relief law from 1965 to 1968 was examined. First, the Control Chart for Patients Recognized as having the Disease Associated with Air Pollution of the Yokkaichi Medical Association was illustrated. The survey showed a gradual decrease in the number of newly recognized patients from 208 in 1965, 179 in 1966, 134 in 1967, to 93 in 1968. However, since the number of patients with continued recognition exceeded that of cancelled patients, the number of patients was gradually increasing. The rate of males with recognized diseases was higher than for females, a six to four ratio. The survey showed a slight increase in bronchial asthma and a slight decrease in chronic bronchitis and pulmonary emphysema. The incidence rate of recognized patients was high among children under five years old, school children, and adults over 40, particularly in school children and adults over 60. According to the results of the follow-up survey for recognized patients who moved out of Yokkaichi City, nearly 90% of the respondents recovered or improved in a short period after transfer. Annual pulmonary function tests revealed that decrease and increase in vital capacity (VC) was about the same in the groups with asthma, bronchitis, and bronchial asthma but decrease in VC was high in the groups with chronic bronchitis and pulmonary emphysema, and the number of cases increased. In order to observe the clinical trend of outpatients, the actual number of clinical days and medical expenses were investigated. The mean of the actual number of days of examination which recognized patients received was significantly larger than that in Mie Prefecture.

17775 APTIC NO. 35979

Truhaut, Rene

PRESENT CONDITION OF THE PROBLEM OF PERMISSIBLE OR TOLERABLE LIMITS FOR POTENTIALLY TOXIC CHEMICALS IN OCCUPATIONAL ENVIRONMENT. *(Etat actuel du probleme des limites admissibles ou tolerables pour les agents chimiques potentiellement toxiques dans les ambiances professionnelles). Text in French. Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris), 32(4-5):353-370, April-May 1971. 15 refs.*

The concept of permissible or tolerable limit cannot be defined unequivocally, for it depends upon the nature of the toxicity of the substances under consideration. Therefore, some limits are time-weighted concentrations, while others are ceiling values. Considerable differences exist between the values recommended by different national organizations, which are due to differences either in evaluation methodology or in interpretation. Permissible limits or, preferably, permissible concentration zones, must be used only as guides for the elimination of occupational disease hazards. A co-operative program was undertaken to study the permissible limits of toxic substances in occupational environments.

17776 APTIC NO. 35064

VandePoele, Arthur R.

THE PHYSICIAN AND AIR POLLUTION: II. *Delaware Med. J., vol 43:148, May 1971.*

Mortality statistics are cited for the London smog of 1952 and the Donora, Pennsylvania, air pollution episode. While greater Wilmington has not suffered from any comparable episode, the area has been ranked by some authorities as fifteenth among the most polluted cities in the United States. Physicians should watch the daily papers which publish an air pollution index and pollution alerts in order to advise their heart and respiratory patients of preventive measures.

17777 APTIC NO. 35345

Wang, Irene Y., Harvey S. Marver, Ronald E. Rasmussen, and T. Timothy Crocker

ENZYMAL CONVERSION OF BENZO(A)PYRENE. HYDROXYLATION VS DNA Binding. *Arch. Internal Med., vol. 128:125-130, July 1971. 20 refs. (Presented at the Hanford Biology Symposium on Pollution and Lung Biochemistry, Annual, 10th, Richland, Wash., June 5, 1970.)*

The dissociation of enzymatically mediated DNA-binding of benzo(a)pyrene from its hydroxylation in induced liver and lung enzyme systems and the distribution of active intermediate metabolities of BaP capable of binding DNA between microsomal membranes and the supernatant of the incubation mixture of microsomes with BaP were investigated. Hydroxylating and DNA-binding activity increased in lung and liver microsomes after induction of enzyme activity by injecting BaP into intact rats. Overall enzymatic activity increased more in the liver than in the lung, and DNA-binding increasd more than hydroxy product formation in microsomes from liver as compared to lung. Chromatographic profiles of metabolic products in extracts of cell and tissue cultures were different from those in the microsomal system. Hematin reduced DNA-binding to a greater degree than metabolite production. The complexity of BaP metabolism and potential carcinogenesis were discussed.

17778 APTIC NO. 35972

Weisz, Henriette, Arthur Brockhaus, and Guenther Koenn

INVESTIGATIONS ON THE BENZO(A)PYRENE CONTENT OF HUMAN LUNGS. *(Untersuchungen ueber den 3,4-Benzpyren-Gehalt von Menschenlungen). Text in German. Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg.: Abt. 1: Orig., Reihe B, vol. 155:142-147, 1971. 10 refs.*

The dust and benzo(3-4)pyrene content of 42 human lungs from the Bochum area of Germany was measured. Of the deceased, 31 were males and 11 were females and except for three cases, the ages of death were beyond 40 years. Six of the deceased males had been miners. The dust content varied between 0.3-18.0 g. Values of 0.3-15.6 micrograms of benzo(3-4)pyrene per lung were determined. In 75% of the positive cases, i.e., where benzo(3-4)pyrene could be determined quantitatively, benzo(3-4)pyrene was found in the tissues. In two cases it was detected in both tissues and dust; in three cases it was found only as a component of lung dust. There was no correlation between the amounts of dust and benzo(3-4)pyrene determined. The benzo(3,4) content of the lung was not correlated with sex, occupation, or other factors.

17779 APTIC NO. 35346

Wyatt, John P.

OCCUPATIONAL LUNG DISEASES AND INFERENTIAL RELATIONSHIPS TO GENERAL POPULATION HAZARDS. *Am. J. Pathol., 64(1):197-216, July 1971. 17 refs. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, Atlantic City, N. J., April 15, 1970.)*

Occupational lung diseases correlated with general population hazards were investigated. The major determinants in the initiation and development of any pneumoconises are the biophysical properties, dust particle sizes, and coexixtence of other lung diseases. Silicosis, black lung diseases, and asbestosis are reviewed as epidemiologic models. Studies of the pathogenesis of these occupational diseases can provide guidelines of reference for investigations in the general environment.

17780 APTIC NO. 35855

Yamamoto, Keiichi and Yoshiko Yamamoto

TOXICITY OF GASES RELEASED BY POLYURETHANE FOAMS SUBJECTED TO SUFFICIENTLY HIGH TEMPERATURE. *Nihon Hoigaku Zasshi (Japan J. Legal Med., Tokyo), 25(4):303-314, July 1971. 32 refs.*

The toxicity of gases released with the combustion of polyurethane foam was investigated using rats. Weighed samples were heated and four rats in an exposure chamber were exposed to the resulting gases which were monitored for carbon monoxide and hydrogen cyanide content. Sample weights of one to three grams resulted in no deaths; at five grams, sixeights of the rats died during exposure. Samples weighing 10 and 15 g caused deaths in all the rats during exposure, with maximum CO and HCN concentrations at 20,000 and 100 ppm, respectively. The effect of each gas on the rats was examined. Fatal doses of CO and HCN for a 30-min exposure were 8000 and 100 ppm, respectively. A group of rats injected with thiosulfate intraperitoneally had a significantly lower death rate after exposure to polyureathne foam gases. (Author summary modified)

17781 APTIC NO. 35838

Yoshikawa, Hiroshi

EXAMPLES OF CADMIUM POISONING. *(Kadomiumu chudoku no jissairei). Text in Japanese. Hyomen Shori Janaru (Metal Finish. J.), 4(7):50-58, July 1971. 23 refs.*

The cadmium concentration in the atmosphere of Japan is approximately 0.01 micrograms/cu m (0.001 0.1 micrograms/cu m) and is comparable to the averages in England and the United States. After discussing cadmium poisoning in general and reviewing data in other countries, examples in Japan are given. One specific incident occurred in a terephthale (?) acid manufacturing plant where cadmium is used as catalyst, during an operation of cutting the bolt of the nest board in the reaction tower. Eight out of 12 workers who were engaged in the operation complained of discomfort and six were hospitalized. The symptoms of subjective nature such as headache, nausea, discomfort in throat, pain in the chest, breathing difficulty, and coughing appeared in 30 min to three hours from the beginning of the operation, and other symptoms such as lack of appetite and debility followed afterwards. Weak and quick breathing were also noted. Chest noise test and X-ray test were negative for all workers. Six workers had 37 to 38 C temperature for one to three days. These records are compared with the symptoms described in previously published data.

17782 APTIC NO. 35118

Zielhuis, R. L.

MEDICAL-BIOLOGICAL EFFECTS OF TRAFFIC EXHAUST. *(Uitlaatgassen van gemotoriseerd verkeer. III. Medisch-biologische gezichtspunten). Text in Dutch. Tijdschr. Soc. Geneesk., 49(20):696-702, Oct. 8, 1971. 93 refs.*

A review of the literature on the medical-biological consequences of exposure to traffic exhaust is presented, with emphasis on gasoline engines. Total emissions, carbon monoxide, lead and other metals, carcinogens, teratogens, mutagens, nitrogen oxides, oxidant smog, and aldehydes are discussed. Acceptable emission limits are proposed. Too little is known in the Netherlands about presen emission concentrations, and systematic monitoring of the environment is urgently needed. (Author summary modified)

17783 APTIC NO. 35986

Zielhuis, R. L.

AIR POLLUTION, SMOKING, AND MEDICINES. *(Luchtverontreiniging, roken en genessmiddelen). Text in Dutch. Tijdschr. Soc. Geneesk., 49(20):704, Oct. 8, 1971. 3 refs.*

Compounds required to produce enzyme induction are effected by environmental pollution. Workers exposed to DDT, eldrin, or related pesticides had liver enzyme induction symptoms. Benzpyrene hydroxylase induction occurs in the placenta of women who smoke cigarettes. Smoking is a voluntary form of air pollution. The dosage of pentazocine required to achieve effects of complete laughing gas narcosis depends on the life style and residence of the individual. A table showing the pentazocine required by smokers and non-smokers and city and farm dwellers is included. The relationship between air pollution, life style, and doses of certain drugs to induce the induction of certain enzymes is discussed.

EFFECTS-PLANTS AND LIVESTOCK

17784 APTIC NO. 35579

Japan Public Health Assoc., Juridical Foundation

SURVEY OF ENVIRONMENTAL POLLUTION BY MERCURY - RESULTS OF MERCURY SURVEY IN FISHERY PRODUCTS. *(Suigin ni yoru kankyo osen chosa. Gyokairui to suigin chosa kekka). Sept. 20, 1970. Translated from Japanese. Leo Kanner Assoc., Redwood City, Calif., 311p., July 1971.*

Results of analyses on fishery products, river bottom mud, and drainage basin soil correlated with environmental pollution by mercury are presented. Mercury contents in food, descriptions of analytical methods, rivers surveyed, mercury standards, and analysis of heavy metals are also included.

17785 APTIC NO. 35210

Allcroft, Ruth

LEAD POISONING IN CATTLE AND SHEEP. *Vet. Rec., 63(37):583-590, Sept. 15, 1951. 11 refs. (Presented to the N.V.M.A., South-Eastern Division, Tunbridge Wells, England, May 24, 1951.)*

Data are presented on increased concentrations of lead in tissues, blood, and feces of cattle following ingestion of various lead compounds and on the possibility of chronic lead poisoning in livestock. Lead compounds clearly cause a rapid rise in the amount of lead in the blood followed by a very slow return to normal levels. The highest tissue concentrations are found in the kidney cortex and liver. Values higher than about 40 ppm in the cortex and 10 ppm in the liver are of definited diagnostic significance where there is collateral evidence of lead poisoning. The fact that blood lead values remain abnormally high even when fecal lead values have returned to normal also has diagnostic value. If both blood and fecal values are elevated, it can be assumed that ingestion of lead occurred within recent weeks. Chronic lead poisoning is unlikely to occur in animals grazing pastures contaminated by plumbiferous dust. The only danger to farm stock, especially bovines, is acute poisoning by paint and rations heavily contaminated with lead compounds.

17786 APTIC NO. 35209

Aronson, A. L, P. B. Hammond, and A. C. Strafuss

STUDIES WITH CALCIUM ETHYLENEDIAMINETETRAACETATE IN CALVES: TOXICITY AND USE IN BOVINE LEAD POISONING. *Toxicol. Appl. Pharmacol., vol. 12:337-349, 1968. 26 refs.*

The most effective therapeutic regimen of calcium disodium ethylenediaminetetraacetate (CaEDTA) for the mobilization of lead in cattle was determined, and toxic effects associated with short-term administration of CaEDTA were evaluated. Optimal conditions of lead mobilization in calves are provided by concentrations in the order of 135 millimicron moles of EDTA/ml of plasma and above maintained for 10-12 hours. These concentrations can be achieved by the constant intravenous infusion of CaEDTA at 110-220 mg/kg over 12 hours or approximated by two rapid intravenous injections six hours apart at 110 mg/kg each. Interperitoneal administration is not as effective as intravenous administration in mobilizing lead. Manifestations of CaEDTA toxicity in heart valves were similar to those observed in man and the dog, but were considerably more extensive than those reported for the rat. Daily 12-hour infusions of CaEDTA at 220 mg/kg were not toxic when maintained for three successive days and were mildly toxic when maintained for five successive days. Macroscopic and microscopic lesions and disturbances in intestines, kidneys, adrenal glands, and other tissues in calves receiving toxic doses are described. Urinary excretions of lead after administration of CaEDTA were determined. (Author abstract modified)

17787 APTIC NO. 35613

Benedict, H. M. and J. P. Nielsen

THE MARKINGS PRODUCED BY VARIOUS AIR POLLUTANTS ON LEAVES. *Proc. Nat. Shade Tree Conf., vol. 32:205-214, 1956.*

External effects of air pollutants on the leaves of various plants include inert or insoluble dusts clogging the stomata and inhibiting light or food, and markings due to corrosive substances, e.g., sulfur trioxide. Internal effects are those caused by absorption of polluting gases or soluble particulate matter into the leaves. Both types of effects, and the characteristic markings caused by exposure to ammonia, chlorine, hydrogen sulfide, nitrogen oxides, chlorine dioxide, sulfur dioxide, hydrogen fluoride, and smog are discussed.

17788 APTIC NO. 35272

Berge, Helmut

SENSITIVITY OF LEAFED TREES AND CONIFERS TO IMMISSIONS IN DEPENDENCE OF LOCATION FACTORS. *(Immissionsempfindlichkeit der Laub- und Nadelhoelzer in Abhaengigkeit von Standortfaktoren). Text in German. Allg. Forstz., vol. 6:90-91, 1969. 12 refs.*

Trees of the leaf type as well as conifers can, under certain circumstances, be exposed to the hazards of air pollution emissions combined with indirect damage from mining operations in neighboring areas. This occurs particularly in cases of changes in the level of the ground water table. If the water table rises considerably, e.g., to about 0.50 m below the soil surface, it may draw nutrients away from the soil under the trees and thus decrease the resistance of the trees to damage by such air pollutants as sulfur dioxide. Conversely, depending on the chemical composition of the water, it may in such a case add nutrients and thus benefit the trees. Undermining can cause a decrease in soil porosity which in turn can lead to increased sensitivity of the trees to phytotoxic immissions. A 60-year-old pine forest is described which had been exposed over the years to immissions of hydofluoric acid, causing typical damage symptoms without endangering their survival. However, when in one particular year level of the water table dropped from 2.6 to 4.2 m from pumping operations in a nearby mining area, the pines virtually died. Other examples are included.

17789 APTIC NO. 35062

Beyer, Elmo M., Jr. and Page W. Morgan

ABSCISSION. THE ROLE OF ETHYLENE MODIFICATION OF AUXIN TRANSPORT. *Plant Physiol., vol. 48:208-212, 1971. 57 refs.*

The role of ethylene-mediated reduction of auxin transport in natural and ethylene-induced leaf abscission was studied in the cotton (Gossypium hirsutum L., cv. Stoneville 213) cotyledonary leaf system. The threshold level of ethylene required to cause abscission of intact leaves was between 0.08 and one ml with abscission generally occurring 12 to 24 hours following ethylene fumigation. The threshold level of ethylene required to reduce the auxin transport capacity in the cotyledonary petiole paralleled that required for stimulation of abscission. In plants where cotyledons are allowed to senesce naturally, there is a decline in auxin transport capacity of petioles and increase in ethylene synthesis of cotyledons. The visible senescene process which precedes abscission requires up to 11 days, and increases in ethylene production rates and internal levels were detected well before abscission. These levels appear to be high enough to cause the observed decline in auxin transport capacity. (Author abstract modified)

17790 APTIC NO. 35287

Botkin, D. B., W. H. Smith, and R. W. Carlson

OZONE SUPPRESSION OF WHITE PINE NET PHOTOSYNTHESIS. *J. Air Pollution Control Assoc., 21(12):778-780, Dec. 1971. 13 refs.*

The effect of ozone on photosynthesis in eastern white pine saplings in growth chambers was studied by infrared gas analysis of needle carbon dioxide exchange. Branches exposed to 50-80 pphm ozone for four hours and 80-90 pphm 03 for three hours appeared to have suppressed net photosynthesis without visible injury. Actual suppression was questionable in view of diurnal variations in net photosynthesis. Photosynthetic rates of treated branches returned to normal levels following this initial exposure. Subsequent exposure to 90-100 pphm of 03 for three and five hours reduced net photosynthesis approximately 80% and significantly altered diurnal patterns. Visible symptoms appeared following this final ozonation.

17791 APTIC NO. 35234

Buck, William B.

BEHAVIORAL AND NEUROLOGICAL EFFECTS OF LEAD. *Iowa State Univ. of Science and Technology, Ames, Veterinary Diagnostic Lab., Environmental Protection Agency Contract CPA 22-69-NEG-107, 51p., 1970. 6 refs.*

Twelve pregnant sheep were exposed to sublethal doses of dietary lead throughout their gestation periods. They were fed varying concentrations of finely metallic lead mixed with a concentrate mixture containing 300 pounds of corn and 200 pounds of soybean meal at a rate of one-quarter pound/sheep/day. Most of the experimental sheep showed clinical signs of lead poisoning one week after beginning the experiment, including anorexia, loss of body weight, and cerebral depression; these symptoms were more marked during the second and third months of the experiment. Three of the experimental sheep aborted during the last trimester of pregnancy, and one of them had a mummified fetus. Five of the experimental sheep did not conceive. Chemical analyses of the tissues collected from euthanized experimental sheep revealed significant levels of lead, while aborted fetuses also revealed significant levels of lead in the liver. Blood lead analysis of two lamb born to the experimental sheep showed 0.14 to 0.17 ppm of lead in the blood for four weeks. The difference between the exposed and control groups for blood lead, urine lead, and urine aminolevulinic acid were highly significant. (Author summary modified)

17792 APTIC NO. 35397

Coburn, D. R., David W. Metzler, and Ray Treichler

A STUDY OF ABSORPTION AND RETENTION OF LEAD IN WILD WATERFOWL IN RELATION TO CLINICAL EVIDENCE OF LEAD POISONING. *J. Wildl. Manage., 15(2):186-192, April 1951. 4 refs.*

The clinical aspects of lead poisoning were investigated in birds which had lead. They were tested for blood cell counts, hemoglobin determinations, and effects on liver, skeleton, and soft tissues. The critical daily dosage level was determined at six to eight mg/kg. The average survival time for birds dosed with 12 mg/kg was 3.5 days less than for birds receiving eight mg/kg of lead, but the deposition of lead in the tissues of the two groups did not differ significantly. Lead metabolism studies established comparable rates of retention for the two levels. (Author conclusions modified)

17793 APTIC NO. 35196

Cormis, L. De

TEN YEARS OF A STUDY ON THE EFFECT OF AIR POLLUTION ON PLANTS. *(Dix annees d etude des repercusseions de la pollution de l air sur les vegetaux). Text in French. Inst. National de la Recherche Agronomiques Paris (France), Lab d etude de la Pollution Atmospherique, 62p., 1970. 17 refs.*

This report deals with the effect of sulfur dioxide and hydrofluoric acid on plants. The S02 essentially causes necrosis in areas between the leaf veins, turning the green color into ivory or reddish brown, depending on the species. Necrosis appears generally on older leaves, and does not subsequently spread beyond the originally afflicted area. The death of a whole tree or shrub due to the presence of S02 in the air is not known to have ever occurred. The phytotoxidity of S02 is at its maximum in weather conditions with close to 100% humidity. In darkness, the pollutant has generally no effect on plants. Necrosis caused by HF appears initially at the leaf edges, but then often progresses to the inner leaf area. Trees bearing stone fruit can sometimes show leaves with little apparent necrosis caused by HF, but the leaves fall prematurely. Cherry, pear and apple trees afflicted by the effect of HF may show a very small amount of necrosis on their leaves, but the fruit can be marked and thereby become unsaleable. By induced artificial air pollution and other means of comparative observation, agricultural researchers in France are working on the problem of which varieties of trees, potatoes, clover, and grasses show a greater resistance to S02 and HF pollution.

17794 APTIC NO. 35869

Costonis, Arthur C.

EFFECTS OF AMBIENT SULFUR DIOXIDE AND OZONE ON EASTERN WHITE PINE IN A RURAL ENVIRONMENT. *Phytopathology, 61(6):717-720. June 1971. 8 refs.*

The effect of air pollution on conifers growing on a plantation about 1.5 miles from an industrialized area was investigated with respect to specific effects of sulfur dioxide and ozone on eastern white pine. Symptoms of acute and chronic injury due to SO2 were determined on both current and old foliage and were correlated with increases in the concentration of ambient SO2. Concentrations of six pphm for four hours induced acute injury to new needles of field trees and adjacent potted indicator plants. Ozone concentrations did not exceed four pphm and were not correlated with injuries. Acute and chronic symptoms are described and lesion severity ratings are discussed. (Author abstract modified)

17795 APTIC NO. 35190

Fenton, A. F.

ATMOSPHERIC POLLUTION OF BELFAST AND ITS RELATIONSHIP TO THE LICHEN FLORA. *Irish Nat. J. (Belfast) April 1964.*

The occurrence of lichens in the atmosphere of Belfast, Ireland, are reported showing that a single species of lichen Lecanora conizaeoides is the only lichen which can tolerate a high degree of atmospheric pollution such as exists in Belfast, but where smoke exceeds 20-25 mg/100 cu m and sulfur dioxide concentration exceeds three pphm, it is unlikely to be found. The percentage cover of this lichen increases fairly regularly and rapidly as smoke concentration falls from 20-25 to 12 mg/100 cu m and S02 concentration falls from 3.5 to 1.8 pphm. The percentage cover of L. conizaeoides may reach 60% or more before any other recognizable crustaceous species occur. When other crustaceous species appear the percentage cover of L. conizaeoides usually decreases. Apparently L. conizaeoides is not only tolerant of a medium smoke and S02 level, but actually thrives in such areas. Whether the deposition of solids is of vital importance is less clear since the lichen occurs in areas where this deposition varies from 140 to over 300 tons/sq mi. Exceptionally, Candelariella vitellina is found within the L. conizaeoides zone, always on cement and lime plaster work, but it is very poorly developed and its presence may be due to favorable nitrogenous contamination. The first foliaceous lichens to appear are species of Parmelia, usually P. Saxatilis, and the estimated smoke contamination level is then below 5 mg/100 cu m and S02 probably less than 1.5 pphm. Fruticose lichens indicate conditions of little or no atmospheric pollution though they may be present as impoverished forms at levels of smoke and S02 concentration only slightly less than those at which foliaceous types first occur. (Author summary modified)

17796 APTIC NO. 35254

Godzik, Stefan

ABSORPTION OF 35-S02 AND ITS LOCALIZATION IN THE LEAVES OF CERTAIN TREES. *Polish Academy of Sciences, Zabrze, Research Inst. of Upper Silesian Industrial Region, Mater. Miedzynorodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 63-77. 14 refs. (Sept. 9-14.)*

A comparative study was conducted of sulfur dioxide(35) absorption by leaves and needles of four tree species: Pinus silvestris, Picea excelsa, Quercus robur, and Betula verrucosa. Considerable differences in intensity of S02 absorption were observed between particular species and also, in the case of Pinus and Picea, between needles of different ages. The greatest quantity of sulfur was absorbed by Betula leaves; the least, by Picea needles. In natural field conditions, Betula is highly resistant to the action of S02 and Picea highly susceptible. The results, therefore, indicate that the susceptibility of a particular species is not governed by the amount of S02 absorbed in a given time. Localization of absorbed sulfur was nonuniform and did not change significantly after 24 hrs, indicating a more or less permanent bonding by the plant material.

17797 APTIC NO. 35259

Greszta, Jan and Janusz Olszowski

THE INFLOW OF AIR POLLUTION UPON THE GROWTH OF A COMMON PINE-TREE AND A BLACK PINE-TREE. *Polish Academy of Sciences, Zabrze, Resarch Inst. of Upper Silesian Industrial Region, Mater. Miedzynarodowej Konf Wplys Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 337-352. 12 refs. (Sept. 9-14.)*

Comparative measurements of branch development in common pines and black pines growing in similar climates and soils showed that the black pine is less damaged by smoke and gases. The species exhibited better acclimatization and greater increase in height, diameter, and volume development. A factor responsible for its resistance to industrial air pollution is bark thickness, which is 100-200% greater than on common pines.

17798 APTIC NO. 35053

Howell, Robert K. and Diane F. Kremer

OZONE INJURY TO SOYBEAN COTYLEDONARY LEAVES. *J. Environ. Quality, 1(1):94-97, Jan.-March 1972. 11 refs.*

The relative sensitivity of cotyledons and primary leaves of several soybean cultivars to ozone is described, as well as the chronological age of maximum sensitivity, stomatal response in the presence of ozone, and the extent of ozone injury to the tissue. Cotyledons and primary leaves were most sensitive to ozone six to seven and 13-14 days after seeding, respectively. Injury was similar to that described for leaves of other crops; that is, upper surface necrotic lesions were generally associated with columnar palisade cells. However, if the concentration of ozone is increased or the tissue is exposed for a longer time, some injury can be envisioned on the lower epidermis and a single layer of oval cells adjacent to it.

17799 APTIC NO. 36028

Irwin, D. S. and R. E. March

BIOLUMINESCENCE AND SINGLET OXYGEN. *Atmos. Environ., 5(12): 1033-1042, Dec. 1971. 19 refs.*

As part of a continuing investigation of the effects of singlet oxygen on compounds of biological interest, bacteria which luminesce in the presence of oxygen were exposed to singlet oxygen. The excited molecular oxygen was generated from solution and by an electrodeless discharge. From an examination of the bioluminescence intensity, spectral distribution, and flash characteristics, it was concluded that the light generating function of the cell was unimpaired and that singlet oxygen acted with the cell in a manner not substantially different to that of ground state oxygen. (Author abstract modified)

17800 APTIC NO. 35185

Jakubczak, Zygmunt and Jan Pieta

SOME MORPHOLOGICAL VARIATIONS OF THE NEEDLES AND SHOOTS OF SCOTS PINE/PINUS SILVESTRIS L./ IN THE POLLUTED SURROUNDINGS OF NITROGEN PLANT AT PULAWY. *Polish Acad. of Sciences, Zabrze, Research Inst. of Upper Silesian Industrial Region, Mater. Miedzynardowej Konf. Wplyw Zanieczyszcen Powietrza na Lasy, 6th Katowice, Poland, 1968, p. 327-335. (Sept. 9-14.)*

In the early spring of 1967 the first symptoms of damage to pine trees were observed in the vicinity of a nitrogen plant at Pulawy, Poland. A strong yellowing and premature needle fall were noted. Morphological analysis revealed a strong elongation of the needles of Scots pine in the damaged stands. Shoots with pathologically elongated needles were significantly shorter than shoots with the needles of normal length. This distribution of needles on the damaged shoots was more compressed in camparison with the unaffected trees.

17801 APTIC NO. 35964

Kadota, Masaya

AIR POLLUTION AND TREES: THE CREATION OF URBAN WOODS. *(Taiki osen to jumoku toshirin no zosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 6(1):31-38, 1971. 14 refs. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)*

The smoke lesions caused by various gases such as sulfur dioxide, sulfuric acid mist, chlorine, hydrogen chloride, hydrogen fluoride, oxidant, and nitrogen dioxide are reviewed. Experiments were conducted on the effect of SO2 on black pines; the increase of sulfur content in the leaves per day (approximately seven hours of exposure) was 0.004%. This figure imposed on a standard mature black pine forest (dry leaves one kg/sq m) means that the forest theoretically has a capacity for absorbing 40 mg of sulfur (80 mg SO2)/sq m/day. The accumulation of dusts on leaf surface and the necessity of green buffer areas in cities are discussed. The amount of green area required per person was calculated by the amount of oxygen discharged and carbon dioxide absorbed by photosynthesis of trees as against the O2 consumption and CO2 emission by human respiratory activities. An adult requires approximately 30 to 40 sq m of wooded area for living. These matters are to be taken into consideration in the future city planning.

17802 APTIC NO. 35880

Kerin, D.

DELIMITATION OF INDUSTRIAL EMISSIONS BY MEANS OF PLANT ANALYSIS. *Protectio Vitae, 16(5):201-202, Oct. 1971. 13 refs.*

Vegetation damage in areas surrounded by metallurgical and industrial plants are mainly caused by sulfur dioxide and fluorine compounds. Plants are much more sensitive than humans or animals to SO2. Many plant varieties show signs of damage at a concentration of 0.3 ppm SO2. Fluorine and it compounds are particularly injurious to cherries, grapes, plums, various ornamental plants, and vegetables. The Ontario variety of apples is very susceptible. Visible damage to buildings is also caused by this group of pollutants. For determination of the effect of the above pollutants on vegetation, needle samples were taken in September and October in polluted areas and compared to needle samples from unpolluted regions. First and second year needles were separated. Average samples were taken from 100 grams dried needles. Sulfate, lead, zinc, iron, and manganese were determined. Plants taken from the immediate vicinity of a glass work were heavily contaminated with fluorine. Concentrations of 4.0 to 25 mg F/kg dried basis were measured. The sulfur concentration was between 0.50 to 1.5% (natural concentration is 0.20%). The lead concentration ranged from 24 to 1.136 mg Pb/kg (natural concentration is 3.0 mg Pb/kg dried needles). The zinc content ranged from 136 to 495 mg Zn/kg dried needles; in unpolluted areas it is 28 to 75 mg Zn/kg.

17803 APTIC NO. 35394

Kerr, Eric D. and John L. Weihing

EFFECTS OF AIR POLLUTION ON VEGETATION IN NEBRASKA. *Nebraska Univ., Lincoln, Extension Service; Dept. of Agriculture, Washington, D. C.; and Nebraska Univ., Coll. of Home Economics, Proc. Explor. Nebr. Pollut. Probl., Lincoln, Nebr., 1971, p. F-1 - F-10. 35 refs. (April 22.)*

The effects of phytotoxic air pollutants on plants in the United States, primarily Nebraska, are reviewed. Plant damage caused by exposure to sulfur dioxide, fluorides, ozone, peroxyacetyl nitrate, ethylene, and nitrogen dioxide include acute and chronic leaf injury, chlorosis, lesions, stipples, flecks, necroses, and abcissions. Toxic doses and plant sensitivity were correlated, and factors affecting plant sensitivity are discussed. The relationship of air pollutants to infectious plant diseases was investigated. Specific damage to plant life in Nebraska and major sources of the phytotoxicants were designated.

17804 APTIC NO. 35410

Kleinman, Abram

INVESTIGATION OF LEAD RESIDUES ON GROWING FRUITS AND VEGETABLES. *Pesticides Monitoring J., 1(4):8-10, March 1968. 6 refs.*

One hundred and thirty-two samples of a variety of mature fruit and vegetable crops grown near heavily traveled highways were collected and analyzed for lead. Samples, ranging from four to 15 lb, were examined without washing or peeling. The smaller samples were ground and mixed in entirety; the larger ones were reduced to about 1kg and then composited, ground, and mixed. Appropriate aliquots were analyzed by the official A.O.A.C. dithizone spectrophotometric procedure. Reported recoveries of added lead in recovery experiments ranged from 70 to 100%. Lead residues were compared with distance from the highway, traffic load, and the period of exposure to these conditions. The data suggest that a difference exists between crops growing adjacent to traffic and crops growing at further distances.

17805 APTIC NO. 35388

Kurata, Masujiro and Akira Hashimoto

STUDY OF EARLY RECOVERY IN-SMOKE DAMAGED AREAS II. POLICY IN THE SMOKE-DENUDED AREA IN ASHIO (CENTRAL HONSHU). *(Engaichi no soki fukkyu ni kansuru kenkyu. Ashio no engai hadakachi fukkyusaku ni tsuite). Text in Japanese. Nihon Ringaku Taikai Koenshu (Proc. Japan. Forestry Soc.), 1956:261-264, 1956.*

Plants containing a lot of nitrogen can withstand damage from smoke. A nitrogen analysis of plant leaves was made of plants in a smoke-denuded area, only 100 m from the smoke source of the Ashio Mine. The area damaged by the smoke damage of July 11-12, 1955, was also investigated. The recovery of both smoke damaged areas is described. In the steeply sloping area like Ashio, where it is very cold, the ground would keep eroding, by frost, rain, and wind, and freezing, thus causing denuding, even when there was no smoke damage; and a large forest fire caused one area to be completely denuded, due to smoke damage. The area where the denuding is discontinuous could be turned into a green area, by avoiding the transfer of earth and sand. Unless the transfer of earth and sand is prevented, even if the automatic smelting facilities are completed and no gas is emitted, the recovery of the denuded area will not be easy. Maebashi Forestry Bureau succeeded in turning the Fukazawa area into green, by planting grass and trees on the denuded area. The plants rich in nitrogen can withstand smoke, and also grow on lean ground. Sufficient fertilizer must be applied, and evergreen grasses should be grown. The same sort of consideration should be paid to the recovery of Kosaka, Naoshima, Hibi, and other smoke-damaged areas.

17806 APTIC NO. 35578

Leonard, C. D. and H. B. Graves, Jr.

SOME EFFECTS OF AIR-BORNE FLUORINE ON GROWTH AND YIELD OF SIX CITRUS VARIETIES. *Proc. Florida State Hort. Soc., vol. 83:34-41, 1970. 6 refs.*

Young Hamlin, Pineapple, and Valencia orange, Orlando tangelo, Dancy tangerine, and March grapefruit trees were grown for 28 months in fine sand in 76-by 29-ft pots at six locations, five of which were exposed to differnet levels of airborne gaseous fluorine compounds. Variable but significant reductions in yield of the six citrus varieties occurred when the spring flush leaves sampled in May 1969 contained from 20-40 ppm fluorine. These leaf fluorine contents resulted from exposure for 11 weeks to air averaging 0.23 to 0.38 ppm fluorine. In most cases, the spring flush leaves sampled in October contained two and a half times as much fluorine as those sampled in May. This increase in leaf fluorine was closely related to the mean fluorine content of air from May to October and to the additonal exposure time. There were also highly significant yield reductions from dilute hydrofluoric acid (HF) applied to bearing orange trees only during the spring blooming season. This fact and the negative correlation between fluorine content of spring flush leaves sampled in May and yield strongly suggest that most of the fluorine-induced injury occurs in the spring bloom period. However very high levels of leaf fluorine accompanied by severe chlorosis can reduce yields the next year even in the absence of fluorine exposure during the period of bloom and fruit set. Only Valencia orange showed a significant reduction in growth.

17807 APTIC NO. 35896

Leonard, C. D. and H. B. Graves, Jr.

SOME EFFECTS OF AIR-BORNE FLUORINE ON GROWTH AND YIELD OF SIX CITRUS VARIETIES. *Proc. Florida State Hort. Soc., vol. 83:34-41, 1970. 6 refs.*

Young trees of Hamlin, Pineapple, and Valencia orange, Orlando tangelo, Dancy tangerine, and Marsh grapefruit were grown for about 28 months in a Blanton fine sand in 76-ft by 29-ft giant pots at six locations, five of which were exposed to different levels of airborne gaseous fluorine compounds from phosphate manufacturing plants. Mean fluorine content of the air varied at the different locations but was below 1 ppb at all test sites. Varying levels of airborne fluorine resulted in relatively small differences in mean tree growth as measured by percentage increase in trunk diameter. Yields of fruit for the 1969-70 crop of Pineapple and Valencia orange and Dancy tangerine from trees in the exposed locations were significantly lower than the yields of these varieties in the control pot. Yields of all six varieties in the two pots exposed to the highest mean levels of airborne fluorine were significantly lower than their respective yields in the control pot. There were significant negative correlations between yields of fruit and mean levels of airborne fluoride, and also between yields of fruit and fluorine content of spring flush leaves sampled in both May and October, 1969. (Author abstract modified)

17808 APTIC NO. 35877

Liebenow, H.

BEARINGS OF IMMISSIONS ON PLANTS AND LIVESTOCK. *(Die Bedeutung der Immissionen fuer Pflanzen- und Tierbestaende). Text in German. Monatsh. Veterinaermed., 26(3):106-111, Feb. 1, 1971. 10 refs. (Presented at the Probevorlesung anlaesslich des Habilitationsverfahrens, Sektion Tierproducktion und Veterinaermedizin, Jan. 20, 1970.)*

Plant and livestock damage from sulfur dioxide, fluorine and its compounds, ozone, and dusts is discussed. The threshold sensitivity limits for plants are 0.3 mg/cu m SO2, 0.01-0.03 mg/cu m fluorine, and 0.2 mg/cu m ozone in ambient air. Pine and fir are among the most sensitive tree species and the sugar beet appears to be the most susceptible plant to these pollutants. Macroscopic damage to plant species from SO2 includes reddish brown color of the coniferous needles and brown spots on the leaves; chlorophyllous alterations and damage of cytoplasmic organelles appear on the microscopic level. A concentration of 0.15 mg/cu m SO2 reduces the daily milk performance in cattle by 9% and the milk fat content by 8%. Aluminum and superphosphate plants are the main sources of fluorine pollutants. Fluorine and its compounds cause the blackening of needle and foliage tips and chloroplast decay in plants. Dental fluorosis is the most common fluorine-induced disease in livestock. Fluorine produces impairment of calcium and phosphorus metabolism as well as alterations in cellulose digestion processes. The bean species appears to be the most sensitive plant to ozone. Ozone causes death from lung edema in livestock and the incidence of lung and skin cancer appears to be twice as high in ozone-polluted areas than in unpolluted air. Arsenic-bearing dusts produce the most damaging effects on livestock following ingestion of dusty feed, and accumulation of dusty layers on plant surfaces hinders normal metabolism.

17809 APTIC NO. 35393

Mamayev, S. A.

SOME RESULTS OBTAINED IN URAL IN THE PROBLEM OF VEGETATION AND INDUSTRIAL POLLUTION. *(Nekotoryye itogi issledovaniy, provodyashchikhsya na urale po probleme Rastitel nost i* *promyshlennyye zagryazneniya). Text in Russian. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej konf. wplyw zanieczyszczen powietrza na lasy, 6th, Katowice, Poland, 1968, p. 249-256. (Sept. 9-14.)*

Studies on the resistence of ornamental plants and woody species of air pollution in the industrial areas of Ural are summarized. Sulfur dioxide, magnesitic dusts, hydrogen fluoride, and smoke were among the agents investigated for their noxious effects. These effects appear to be most severe in rainy days. The coniferous species appear to be the least resistant woody specimens to industrial pollutants. The physiologically less active woody species, with lower rates of photosynthesis and respiration, appear to be more resistent against sulfur dioxide. Approximately 50 kinds of waste emanations, which could be used as agricultural fertilizers, were determined. They were cathegorized under calcium, phosphorus, potassium, magnesium, and nitrogen containing wastes, organic wastes and microelement-containing wastes. Agrotechnical methods for soil treatment and plant care, as well as a selection of plants appropriate for the conditions existent in the industrial areas of Central and Southern Ural, have been worked out.

17810 APTIC NO. 35810

Mountford, M. D.

POPULATION SURVIVAL IN A VARIABLE ENVIRONMENT. *J. Theor. Biol., vol. 32:75-79, 1971. 4 refs.*

The nonbreeding reserve of mature individuals in a population subject to a variable environment serves to increase the relative growth rate in population size and also to guard against extinction. The proportion of nonbreeders in the population defining the maximum relative growth rate is not necessarily the same as the proportion defining the minimum probability of extinction. The optimum proportion for survival is a resultant of the two effects. That the two effects are not always equivalent is illustrated by calculated results for the nonbreeding portion of annual plants in a changing environment. (Author abstract modified)

17811 APTIC NO. 35792

Oelschlaeger, Walter

THE PROBLEMS OF EMISSION MEASUREMENTS OF FLUORINE CONCERNING THE EFFECTS ON PLANT AND ANIMAL. *(Problematik der Immissionsmessungen von Fluor hinsichtlich der Wirkungen auf Pflanze und Tier). Text in German. Staub, Reinhaltung Luft, 31(11):457-459, Nov. 1971. 27 refs.*

The fluorine content of the ambient air can be determined by two methods: either the gaseous fluorine compounds are determined or the gaseous F compounds plus the F compounds contained in the fly ash are determined. Plant damage is almost exclusively caused by the gaseous F compounds in the atmosphere. Industries emit mostly hydrogen fluoride and silicon fluoride. These gases are easily absorbed by plants through the stomata. The damage caused by fluorine compounds found in fly ash on plants is minimal. This can be confirmed by experiments with apple, pear, and cherry trees and with lilac. The soil in which the plants grew contained 1.5 g/kg fluorines and the fly dust applied to the leaves contained 12 g/kg and 132 g/kg. After weeks of application, no injuries could be observed. Apart from the gaseous F compounds in the atmosphere, resistance, water metabolism, nutrient supply, relative humidity, and light intensity must be taken into consideration. Cattle are most sensitive to higher fluorine intakes. Fluorine compounds are either ingested with food or drinking water or inhaled. Cattle's tolerance limit for fluorine intake with the fodder is 30 to 40 ppm referred to dry substance, which is less than one mg/kg body weight. Experiments have shown that higher F concentrations in hay hardly raised the F content in bones above that in cattle receiving sodium fluoride. The same is true for the F intake from fly dust adhering to grass. Therefore it is better to use only the measurement of gaseous emissions for any evaluation of the injurious effect of fluorine. The F content on and in plants should be separately determined by the carbon tetrachloride method.

17812 APTIC NO. 35827

Page, A. L., T. J. Ganje, and M. S. Joshi

LEAD QUANTITIES IN PLANTS, SOIL, AND AIR NEAR SOME MAJOR HIGHWAYS IN SOUTHERN CALIFORNIA. *Hilgardia, 41(1):1-31, July 1971. 27 refs.*

The lead content of 27 varieties of consumer crops and plants growing near some major southern California highways were colorimetrically ascertained. Amounts of Pb were also recorded for surface and subsurface soils and in suspended air particulates at or near the locations where the plant samples were obtained. Exposed tissues of plants grown very close to highways contained more Pb than similar tissues of plants grown some distance from the highways. This effect was most apparent at distances less than about 150 meters from the highway. Exposed tissues with smooth surfaces accumulated more lead than tissues with rough, hairy surfaces. The direction of the prevailing wind also significantly affected Pb concentratons in plants near highways: without exception, Pb in plants on the leeward side of the road exceeded that in plants on the windward side. A motor vehicle density of 35,000 vehicles/day also resulted in substantial Pb accumulations in plants. In soils and suspended particulates, lead concentrations were influenced by distance from highway and direction of prevailing winds. These results all demonstrate that the lead accumulations were caused primarily by aerial deposition and not -- at least to any great extent -- by absorption by the plant from Pb-contaminated soil.

17813 APTIC NO. 35770

Sokolowski, Aleksander W.

THE IMPACT OF AIR POLLUTIONS EMITTED BY THE NITROGEN PLANT AT PULAWY ON FOREST VEGETATION. *(Wplyw na roslinnosc lesna zanieczyszczen powietrza emitowanych przez Zaklady Azotowe w Pulawach). Text in Polish. Sylwan, 115(3):47-56, 1971. 2 refs.*

The effect of nitrogen plant emissions on forestry was investigated at Pulawy, Poland. The plant emitted mainly ammonia, nitrogen oxide, and ammonium saltpeter. The forest tract was composed of pine trees with a sporadic mixture of common birch, durmast oak, and English oak. Early in 1967, the drying of pines in the forest around the plant was recorded. By the spring of 1968, more than two hectares of the forest had died, increasing to the serious destruction of 100 hectares by 1969 and obvious symptoms of ruin on some 700 hectares. The process of forest disappearance within the zone of high pollution concentration was quite rapid; forest associations died within one year. A treeless zone was formed, soon covered with garden weed species and plants. Some agricultural solutions are discussed.

17814 APTIC NO. 35262

Temple, Patrick J.

DOSE-RESPONSE OF URBAN TREES TO SULFUR DIOXIDE. *Preprint, Air Pollution Control Assoc., Pittsburgh Pa., 28p., 1970. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 15-18, 1970, Paper 70-145.)*

Controlled fumigation experiments were conducted to determine the dose-response relationships for four species of urban trees (ginkgo, Norway maple, pin oak, and Chinese elm) exposed to sulfur dioxide. Resistance to S02 increased among the species in the following order: Chinese elm, Norway maple, gingko, and pin oak. Elm developed almost 100% leaf necrosis at exposures over 2 ppm for six hours and severe chlorosis and necrosis at 0.25 ppm for 30 days. Leaf necrosis (50%) occurred on Norway maple at 3 ppm for six hours and on gingko at 4 ppm for six hours; both species developed moderate marginal chlorosis at 0.50 ppm for 30 days. Injury to pin oak was minor, even at 8 ppm for eight hours, but slight overall chlorosis was determined on the leaves at 0.50 ppm for 30 days. Relative susceptibilities of the species were the same in long and short-term exposures. Duration of exposure and pollutant concentration were of equal importance in producing injury on Chinese elm and pin oak; on Norway maple and gingko, S02 concentration was of greater importance than duration of exposure. (Author abstract modified)

17815 APTIC NO. 35192

Tingey, David T., Richard A. Reinert, John Dunning, and Walter W. Heck

VEGETATION INJURY FROM THE INTERACTION OF NITROGEN DIOXIDE AND SULFUR DIOXIDE. *Preprint, Air Pollution Control Office, Raleigh, N. C., Div. of Effects Research, 19p. 1971. 19 refs.*

Six plant species were exposed for four hours to nitrogen dioxide and/or sulfur dioxide in greenhouse exposure chambers. Although concentrations of N02 below 20 pphm and concentrations of S02 below 50 pphm caused no leaf injury, injury did develop when plants were exposed to mixtures of 5 to 25 pphm of each of the two gases. Leaf injury from either N02 or S02 alone occurred as marginal and/or interveinal bifacial necrosis. Injury produced by a mixture of the two gases appeared as chlorotic and necrotic flecking on the upper surface of the interveinal areas of tomato, radish, oats, and tobacco. Reddish-brown lesions (stipple) developed on pinto bean and soybean leaves. Lower-leaf-surface injury frequently occurred in the mixed gas fumigations with little or no upper surface injury. The concentrations of N02 plus SO2 which caused plant injury were similar to those found in urban areas, and may result in yield losses to plants grown under field conditions. (Author abstract modified)

17816 APTIC NO. 35929

Tingey, David T., Walter W. Heck, and Richard A. Reinert

EFFECT OF LOW CONCENTRATIONS OF OZONE AND SULFUR DIOXIDE ON FOLIAGE, GROWTH AND YIELD OF RADISH. *J. Amer. Soc. Hort. Sci., 96(3):369-371, May 1971. 12 refs.*

The Cherry Belle radish was exposed to five pphm ozone and/or five pphm sulfur dioxide for 40 hr per week for five weeks and compared with controls grown in charcoal filtered air. Ozone and/or sulfur dioxide significantly reduced the plant fresh weight, leaf fresh weight, root fresh and dry weight, and root length and width. The effects of the combination of the two gases were additive except for plant fresh weight, root length, and root fresh and dry weights where the effects were significantly less than additive. Low concentrations of ozone and sulfur dioxide can be significant factors in the growth and yield of radishes. (Author abstract)

17817 APTIC NO. 35229

Weaver, J. E. and A. Mogensen

RELATIVE TRANSPIRATION OF CONIFEROUS AND BROAD-LEAVED TREES IN AUTUMN AND WINTER. *Botan, Gaz., 168(6):393-424, Dec. 1919. 23 refs.*

Seedling conifers were potted during May according to the size of the plants and demands of the root systems. In September, the trees were transplanted from the pots to galvanized iron containers. Soil samples for moisture content determinations were taken. Finally the pots were sealed. The broad-leaved trees were handled identically except that they were grown from seed sowed in flats in greenhouses. Transpiration losses were determined by weighing the containers. Autumn transpiration losses from conifers are just as great as or even greater than those from broad-leaved trees. The decrease 0in water losses resulting from defoliation is gradual in broad-leaved trees, and not greatly unlike the decrease in the transpiring power of conifers. Winter transpiration losses from conifers are only fifty-fifth to one-two hundred fifty-first as great as those in autumn. The increased loss of broad-leaved trees in spring occasioned by foliation are in proportion to the leaf areas exposed, and are closely controlled by weather conditions, but mainly are similar to increased losses of conifers. Winter transpiration losses from conifers are scarcely greater than those from defoliated stems of broad-leaved trees. (Author summary modified)

17818 APTIC NO. 35395

Woods, Walter

AIR POLLUTION EFFECTS ON ANIMALS. *Nebraska Univ., Lincoln, Extension Service, Dept. of Agriculture, Washington, D. C., and Nebraska Univ., Lincoln, Coll. of Home Economics, Proc. Explor. Nebr. Pollut. Probl., Lincoln, Nebr., 1971, p. G-1 - G-6. 18 refs. (April 22.)*

The effects of air pollution emitted as products of organic matter decomposition or industrial contaminants on animals especially cattle and livestock are reviewed. Sources of pollution and toxicity correlated with concentration, meteorology, length of exposure, topography, and other variable factors are outlined. Ill effects caused by ammonia, hydrogen sulfide, nitrogen oxides, methane, smoke, automobile exhaust, and flourides included severe irritation, death due to poisoning, lameness, respiratory diseases, and body weight changes.

EFFECTS-MATERIALS

17819 APTIC NO. 35356

Berindan, Cornelia

ATMOSPHERIC POLLUTION AND HISTORICAL MONUMENTS. PROBLEM OF CONTEMPORARY URBANISM. *(Pollution atmospherique et monuments historiques. Probleme de l urbanisme contemporain). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 23(324):498-503, Nov. 1970. 36 refs.*

The deterioration of six historical monuments in Romania caused by air pollution was studied by determining the degree of blackening and soiling of their surfaces, the degree of surface abrasion, the incorporation of SO2 and CO2 into stones containing carbonates, the indirect effect of pollutants activated by sunlight, and the electrochemical corrosion of metals used in constructing such monuments. Recommended control measures include limitation of all noxious emissions at their source, increased stack heights of individual emission sources, location of new sources of pollution away from historical monuments, interposition of green belts between industrial zones and historical centers, afforestation of the perimeters of historical monuments, and installation of centralized urban heating supplied by thermal plants located at a great distance from the monuments. Where non of these measures can be instituted protective coating can be considered. Such coating are better suited for metallic objects than for stone; for the latter, only fluorosilicates are of any use, but impregnation is expensive.

17820 APTIC NO. 35159

Bohnenkamp, K.

LABORATORY STUDY OF ATMOSPHERIC CORROSION. *(Etude en laboratoire de la corrosion atmospherique). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 23(324):506-511, Nov. 1970.*

Atmospheric corrosion of test bars (surface, 30 sq cm) of unalloyed (0.026% C, 0.023% Cu, 0.035% P) and alloyed (0.1% C,0.37% Cu, 0.12% P,0.4% Cr,0.48% Ni) steel caused by the addition of 0.04 g SO2/sq m per day to the atmosphere was studied in the laboratory by continuous volumetric measurement of the oxygen consumption due to corrosion. In pure oxygen saturated with water vapor, no oxygen consumption and corrosion were noted on the test bars after 40 days of exposure. On cooled bars covered once a day by water drops, the loss of iron due to corrosion was 3 g/sq m/day. Without cooling and apparent condensation water, corrosion began only following exposure to SO2. A single exposure to 1 g SO2/sq m yielded a corrosion curve rapidly decreasing with time. Daily exposure to 0.015 g SO2/sq m yielded an approximately horizontal corrosion curve which began decreasing only when the daily addition of SO2 stopped. The appearance of fine disk-shaped crystals (sulfate) after 16 hours of exposure to 0.07 g/sq m on the surface of thin rust layers was observed by electron microscopic examination. The correlation between corrosion and duration of exposure is not simple. Corrosion curves for various daily additions of SO2 were determined experimentally.

17821 APTIC NO. 35402

Haynie, Fred H. and James B. Upham

EFFECT OF ATMOSPHERIC POLLUTANTS ON CORROSION BEHAVIOR OF STEELS. *Preprint, Air Pollution Control Office, Raleigh, N. C., Div. of Effects Research, 27p., 1971. 21 refs.*

Three types of steel were exposed at urban and rural sites in Chicago, Cincinnati, Detroit, Los Angeles, New Orleans, Philadelphia, San Francisco, and Washington, D. C., to determine the effects of atmospheric pollutants on their corrosion behavior. The effect of location, duration of exposure, pollutant concentrations, and environmental factors on plain carbon steel, copper-bearing steel, and low-alloy weathering steel was investigated. Correlation coefficients for constants describing corrosion behavior included temperature, precipitation, relative humidity, and concentrations of particulates, sulfur dioxide, oxidants, nitric oxide, and nitrogen dioxide. Corrosion behavior as measured by weight loss, was nonlinear with time and was a function of SO2 and photochemical oxidant concentrations. Sulfur dioxide accelerated corrosion; oxidants reduced corrosion, possibly by forming more protective oxide films.

17822 APTIC NO. 35158

Hissel, J. and L. Lilet

LABORATORY STUDY OF ATMOSPHERIC CORROSION OF STRUCTURAL STEEL. METHODS AND RESULTS. *(Etude en laboratoire de la corrosion atmospherique des aciers de construction. Methodes et resultats). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 23(324):520-527, Nov. 1970. 5 refs.*

The interaction of steel with the environment, including oxygen exchange, water exchange, sulfur dioxide exchange, and the reactions in the sulfated surface film, were studied on samples of steel under controlled conditions in the laboratory and on steel exposed to the atmosphere. The constituents of the sulfated film were extracted from the rust without attacking the hydrated iron oxides of the rust or the underlying metal and without changing the state of oxidation of the substances present. The protected samples corroded proceeded much faster pace than unprotected steel, indicating that corrosion defined by weight loss is smaller for unprotected steel and that protected steel is potentially more corrodible as a result of different characteristics of the sulfated surface film. The electrolyte of the film was much more concentration in steel samples protected from the atmosphere, this elevated electrolyte concentration accounts for the substantial increase in the rate of corrosion. The Fe+++/Fe++ ratio in films on unprotected steel was higher than in protected steel. This ratio is inversely proportional to the degree of corrosion. The sulfated film on unprotected steel contained more free sulfuric acid than that on protected stee. Thus resistance to corrosion increases with increasing acidity of the sulfated film. The redox potential of the surface film governs corrosion the higher the redox potential, the slower the oxidation of the steel.

17823 APTIC NO. 35096

Inagaki, Nobuo and Naomi Emukai

TELEPHONE EXCHANGE AIR PURIFICATION IN AN INDUSTRIAL DISTRICT. *(Kogyochitai ni okeru kyokunai kuukisenjoho). Text in Japanese. Denki tsushin kenkyusho kenkyu jitsuyoka hokoku (Elec. Commun. Lab. Tech. J.), 20(7):87-98, July 1971. 11 refs.*

A corrosion problem was discussed for a telephone exchange station sited in an industrial district. Surveys of environmental sources of corrosion and the effect of an activated carbon filter for removal of toxic gases are discussed. Hydrogen sulfide, sulfur dioxide, and oxidizing substances were found in the area of the Kitajima Telephone Exchange Station. The H2S gas was greatest in volume and most troublesome. The filtration by activated carbon was not effective for removing toxic gases. A basic, preventive measure was to cut off the machinery from the open air. Toxic gases in the staton should be as low as 0.01 ppm. Because metal corrosion by toxic gases was strongly affected by humidity, the humidity in the station should be maintained below 60% RH, and 40% RH when an activated carbon filter was used. New countermeasures for the prevention of corrosion were indicated: separating the electric battery room, sealing the automatic machinery room completely, and installing devices for removal of toxic gases.

17824 APTIC NO. 35460

Ishii, Yoko, Hiroshi Abe, Kanji Narumi, and Miyakuchi Matsumura

ESTIMATION OF AIR POLLUTANTS DEPOSITION ON INSULATOR BY CHEMICAL ANALYSES. *Railway Tech. Res. Inst. Quart. Repts., 11(4):231-233, 1970.*

NTIS: PB 197898

The influence of atmospheric pollutants on insulator soiling was studied. Deposits on surfaces of an insulator exposed at nine sites in a one-year period were isolated by a chemical stripping technique, or with a knife, and evaluated by X-ray diffraction, emission spectrochemical, or X-ray spectrochemical analysis. Analytical results for deposits at severely polluted sites and principle soiling pollutants are summarized. Electroconductive matter detected included chloric ion from sea water and sulfates from industrial gases. Water-insoluble matter, such as soil and ferric oxide particles, was found at all sites. Dust was not a problem in non-industrial areas far from the sea.

17825 APTIC NO. 35479

Limbourn, G. J., I. Purdam, R. T. Henderson, F. Edmondson, and G. T. Glasson

AUSTRALIAN SERVICE EXPERIENCE WITH POLLUTION OF HIGH VOLTAGE INSULATION. *Elec. Eng. Trans., Inst. Eng., Aust., 7(2):45-53, Sept. 1971. 8 refs. (Presented at the Institution of Engineers Engineering Conference, Annual, Adelaide, Australia, March 22-26, 1971, Paper 2961.)*

Service experience by major electrical supply authorities in Australia with pollution of high voltage insulation and control and preventive measures are reviewed. The major causes of pollution of high voltage insulation included sea salts, with aggravated effects due to low rainfall conditions; industrial pollution, i.e., airborne ash and dust containing soluble metallic salts; and natural ground dust. Field tests and quantitative pollutant measurements at determined points in Australia are discussed. Studies of the flashover mechanism are described. Methods adopted to minimize the effects of pollution included insulator washing, insulator greasing, and increased use of open and aerodynamic insulator profiles. Methods to determine insulator performance must consider the performance number as a guide, the insulator profile, and prevailing weather conditions.

17826 APTIC NO. 35773

Volskaya, A. S.

HYDROPHOBIC COATINGS PROVIDING INCREASED RELIABILITY FOR HIGH VOLTAGE INSULATION. HYDROPHOBIC PASTES OF THE ORGRES. *(Gidrofobnyye pokrytiya dlya povysheniya eksploatatsionnoy nadezhnosti vysokovoltnoy izolyatsii Gidrofobnyye pasty ORGRES). Text in Russian. Energetik (Moscow), no. 9:33-34, 1971.*

New hydrophobic pastes utilized to increase the performance of high voltage insulations in polluted areas are discussed. These pastes appear to be qualitatively as good as their imported counterparts. They prevent accumulation of dust, coal, cement, or other pollutant particles on the insulating surface and elicit good dielectric qualities. They appear to be effective against chemical and cementing pollutants when cleaning and washing operations appear to be unsatisfactory. The thickness of these coatings should constitute 0.2-0.5 mm in highly dust-polluted areas. Testing under various climatic and air pollution conditions throughout the USSR showed these coatings to be reliable for 1.5-2.0 years.

17827 APTIC NO. 36005

Yamasaki, Shohachiro and Yasuo Yokoi

ACCELERATED ATMOSPHERIC CORROSION TESTS IN POLLUTED AIR. (2ND REPORT). INFLUENCE OF DEWING ON MILD STEEL IN SULFUR DIOXIDE ENVIRONMENT. *(Jinko osen kuki ni yoru taiko sokushin shiken no kento (dainiho), aryusan gasu funiki de no hatsuro joken to fushokuryo (ko)). Text in Japanese. Boshoku Gijutsu (Corrosion Engineering, Tokyo), 20(11/12):23-29, Dec. 1971. 5 refs.*

The influence of the quantity of dewing and the interval of dew-cycle on the corrosion of a mild steel panel exposed in an atmosphere of 20 ppm sulfur dioxide, 95 to 100% R.H. was investigated and evaluated from the viewpoint of similarity to field test, acceleration of test, and reproducibility of test result. The grade of dewing was classified into the critical dewing (temperature difference between specimen and atmosphere: TD equals approximately 0), the light dewing (TD equals two C), and the heavy dewing (TD equals five C). As dewing period (min)/drying period (min), 15/15,30/30,60/60, and 120/120 were selected, besides continuous dewing during the test period of 24 hr. In heavy dewing, the shortest interval of 15 min/15 min showed the largest amount of corrosion, but the similarity to the corrosion pattern of the field test was weak. The reproducibility under the condition of the cyclic heavy and light dewing was very good, while that in the cyclic critical dewing was unstable. Continuous dewing except the critical one had the tendency to reduce acceleration and similarity. To satisfy the similarity, acceleration, and reproducibility in the laboratory test, the condition of light dewing and comparatively rapid dew-cycle at 30 min/30 min was optimum.

EFFECTS-ECONOMIC

17828 APTIC NO. 35321

EMISSIONS CONTROVERSY ENTERS PHASE II. *Eng. Mining J., 172(12):78-81, Dec. 1971.*

The copper industry contends that almost insurmountable economic-engineering problems stand between it and compliance with the 90% sulfur control standard adopted by various states. Producers in Washington and Arizona are currently petitioning for lower standards. Sulfuric acid production, the only well-established method for removing sulfur oxides from smelter gases, will not of itself yield 90% sulfur control. New technology is required for the smelting, handling, and concentrating of normally dilute gases from reverberatory furnaces. Estimated capital costs for copper smelters to meet the 10% emission limit in the required time limits range from $600 million to one billion. Given time to develop adequate new technology, the collective cost to the industry could be $345 million. Further cost data should become available this year with the release of a cost control study contracted by the Environmental Protection Agency. The 10% emission limit for sulfur is not a part of federal law. Several smelters may approach or meet federal primary and secondary ambient air standards due to location, meteorological conditions, feed sulfur content, and smelting practice.

17829 APTIC NO. 35372

Stanford Research Inst., Menlo Park, Calif.

ECONOMIC IMPACT OF AIR POLLUTANTS ON PLANTS. VOLUME II. ANNUAL REPORT. *Coordinating Research Council-APRAC Proj. CAPA-2-68, SRI Proj. PSH-8115, 558p., Nov. 1970.*

NTIS: PB 200236

Estimated losses due to ozone, peroxyacetyl nitrate, and oxides of nitrogen are presented for sixty-eight crops that are sensitive to those air pollutants. The information is presented for 525 counties in which the level of air pollution from those pollutants was considered to be high enough to cause significant crop losses. Prices, quantities, and values of the crops are also included, except that for most vegetable, nursery, and forest products only the total values of the crops were tabulated. The dollar loss for each crop was calculated by using the total value of the crop in each county, and the percentage of the crop value that Stanford Research Institute estimated was lost due to air pollution. A computer program was set up to organize the data and calculate the losses.

17830 APTIC NO. 35391

Dept. of Commerce, Washington, D. C., Technical Advisory Board Panel on Automotive Fuels and Air Pollution

THE ECONOMICS OF UNLEADED GASOLINE. AN APPENDIX. *78p., Nov. 1970.*

NTIS: COM 71-00568

In order to develop raw economic data needed to evaluate various lead control proposals, two independent conclusions were obtained on the economics of increasing refinery octane capacity without lead, from a survey by questionnaire of the refinery industry and from a refinery simulation study using linear programming techniques. Based on these results, a model was constructed to weigh cost functions against legislative demands for unleaded fuel from 1970-1980, to weigh these demands for unleaded fuel on the construction industry, and to assess various marketing factors. The model generated an estimate of the value for total investment required and provided a convenient plot of the decay rates of total lead used nationally in gasoline production for various strategies from 1970-80. The magnitude of the effects of fuel penalties on the over-all economics of lead reduction was also assessed. Results indicate the low cost of producing low-octane low- and unleaded gasolines relative to some industry estimates. In general, these preliminary results identify the three-pump strategy as the most cost-effective in minimizing the impact of a lead reduction program. It also appears that retaining some lead in present regular (94) and premium (100) gasolines in the near term offers distinct advantages in terms of refinery investment demand.

17831 APTIC NO. 35532

Alonso, J. R. F.

ESTIMATING THE COSTS OF GAS-CLEANING PLANTS. *Chem. Eng., 78(28):86-96, Dec. 13, 1971. 15 refs.*

Cost correlations are presented for seven general types of gas-cleaning plants: dry centrifugal collectors, fabric collectors, electrostatic precipitators, direct-flame incineration devices, catalytic incineration devices, wet collectors, and mist eliminators. Costs considered are those of the actual cleaning units plus costs of power and prime movers, sheetmetal elements and bar stock; chimney erection and installation; and maintenance when running a cleaning unit at its specified collection efficiency. For the most part, the data are presented in terms that are independent of local currency. Where this was not possible, 1970 U. S. dollars are used.

17832 APTIC NO. 35335

Fowler, Don G.

POLLUTION CONTROL AND ECONOMICS. *Pollut. Control, 1971:6-7, Sept. 1971. 1 ref.*

Economics is the overriding consideration in automotive emission controls and control of sulfur dioxide emissions. The cost consequences of installing pollution controls, the health aspects correlated with economic factors, and economic guidelines are discussed. The choice between costs and legislation is explained.

17833 APTIC NO. 35215

Schoenberger, Robert J., Henry C. Wohlers, and Walter E. Jackson, Jr.

REGIONAL AIR QUALITY CONTROL - THE IMPACT AND COSTS OF REFUSE INCINERATION. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1970. 19 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, New York, Nov. 29-Dec. 3, 1970, Paper 70-WA/INC-1.)*

A systems approach is used to investigate the alternatives of reducing atmospheric emissions from refuse incineration in a metropolitan area -- the Philadelphia region encompassing eleven counties in the three states of New Jersey, Delaware, and Pennsylvania. Alternatives considered include the addition of modular equipment to existing units, construction of new units, and the substitution of alternate disposal techniques. These include the rail-haul strip mine proposal, composting, and on-site compaction. Methods are developed to estimate the costs associated with reducing air pollution emissions by these various techniques. Estimated capital costs of 4.8 million dollars and incremental operating costs of 2.3 million dollars are required to reduce the emissions by 90%. (Author abstract)

17834 APTIC NO. 35710

Vars, R. Charles and Gary W. Sorenson

ECONOMIC EFFECTS OF CHANGES IN AIR QUALITY. ANNUAL REPORT). *Oregon State Univ., Corvallis, Air Resources Center, National Air Pollution Control Administration Contract CPA 70-117, 58p., June 1971. 9 refs.*

NTIS: PB 201409

The specification and estimation of the pollution production functions associated with open burning of agricultural fields in the Willamette Valley are presented. To economists, the problem of accounting for the impact of this burning process on visibility appeared analogous to the problem in economics of estimating what is called a production function: production function is an analytical concept that asserts the existence of a set of fixed relationships between an output or set of outputs on the one hand and a set of inputs on the other. A pollution production function was regarded as an analytical concept that postulates the existence of a set of stable relationships between daylight visibility in particular locations in the Valley under varying present and recently past meteorological conditions (winds, inversion height, stability, and visibility are given) are recently past emission rates throughout the Valley. A statistical analysis of the variables was made. Residue removal costs for grass seed crops are given. The effects of air quality on tourist related industry were studied with a questionnaire.

STANDARDS AND CRITERIA

17835 APTIC NO. 35791

Japan Society of Industrial Hygiene

ADVICES CONCERNING MAXIMUM PERMISSIBLE CONCENTRATION (1971). *(Kyoyo nodo nado no kankoku). Text in Japanese. Rodo Kagaku (J. Sci. of Labour, Tokyo), 47(12):766-775, Dec. 1971. 9 refs.*

Recommendations of the Japan Society of Industrial Hygiene on the maximum permissible concentration of various chemicals in the working environment are presented in a table form with explanatory comments. The list include more than 90 chemical compounds and dusts of various minerals. The standards were set with consideration for the chemical toxicity or special damaging effects on skin or respiratory systems. Other conditions such as temperature, ultraviolet ray, radiation, and extraordinary air pressure were not taken into consideration in selecting indices of maximum permissibility; but such conditions are factors that intensify the discomfort of existing conditions and therefore must be taken into consideration in applying the figures recommended by the society. The methods of measuring dust, equipment for measurement, and particle size are discussed. An electrostatic precipitator, an impinger, and a filter collector comprise one group of equimpent recommended; the other consists of a filter paper dust meter, a digital dust meter, dustalo (??), and a Tyndalloscope. The society also recommends designation of 50 ppm (55 mg/cu m) of carbon monoxide as the maximum permissible concentration in work environment instead of 70 to 80 ppm which is medically considered safe.

17836 APTIC NO. 35858

SULFURIC ACID MAKERS FIGHT BACK. *Chem. Week, 109(23):33-34, Dec. 8, 1971. 3 refs.*

Producers of sulfuric acid claim that the proposed emission standards of the Environmental Protection Agency, limiting sulfur dioxide emissions to four lb/ton and acid mist emissions to 0.15 lb/ton, are inflexible and cannot be met consistently over the lifetime of a plant. Although the standards will apply only to new plants, acid makers fear that states might enforce the rules at older plants as well. The producers concede that new plants can be built to meet the proposed standards during lined-out operation, but some producers feel that frequent cleaning to meet the standards would entail additional shutdowns and startups, resulting in greater pollution loads in the long run. Operating problems with new double absorption plants and costs involved are reviewed.

17837 APTIC NO. 35384

Barth, Delbert S., J. Cyril Romanovsky, John H. Knelson, Aubrey P. Altshuller, and Robert J. M. Horton

DISCUSSION OF NATIONAL AIR QUALITY STANDARDS FOR AUTOMOTIVE POLLUTANTS: A CRITICAL REVIEW. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1971. 21 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 1971, Paper 71-37.)*

A paper by J. M. Heuss, G. J. Nebel, and J. M. Colucci, which challenges the recently published National Ambient Air Quality Standards, is discussed. Its basic premises were: many bits of information required to place the present National Ambient Air Quality Standards on an irrefutable and unassailable scientific basis are not yet available; in view of this, National Ambient Air Quality Standards should be formulated in a way that does not impose undue economic burdens on industry and on the consumer, who ultimately will have to absorb the cost. However, national standards on such an important matter as air pollution must be established at levels that contain a sufficient safety margin to provide reasonable certainty that all sensitive population groups in the United States will be protected. Economic factors must be secondary to this primary consideration. Specific reference is made to effects from exposure to carbon monoxide, the measurement of nitrogen dioxide by the Jacobs-Hochheiser methods, the Chattanooga epidemiological study, adverse effects of hydrocarbons, the hydrocarbon-oxidant relation, photochemical oxidants, and background ozone concentrations.

17838 APTIC NO. 35520

Katz, Morris

INTERSOCIETY COMMITTEE METHODS FOR AMBIENT AIR SAMPLING AND ANALYSIS. *Health Lab. Sci., 8(4):241-242, Oct. 1971. 1 ref.*

The Intersociety Committee was organized in March 1963 as a joint project of several societies and associations, with the main objective to produce standardized methods of sampling and analysis for routine investigations of air pollution. This is the seventh published collection of methods adopted as tentative by the Intersociety Committee for a Manual of Methods for Ambient Air Sampling and Analysis. Tentative stadards were adopted for methods for suspended particulates, settling particulates, respirable dust, gases and vapors.

17839 APTIC NO. 35390

Plaks, Norman

IMPROVED PROCESSING METHODS FOR CONTROL OF AIR POLLUTION EMISSIONS FROM COKEMAKING. *Preprint, Economic Commission for Europe, 27p., 1971. 3 refs. (Presented at the Seminar on Problems of Air and Water Pollution in the Iron and Steel Industry, Leningrad, USSR, Aug. 23-28, 1971.)*

In the United States, the first set of Federal emission standards for coke plants will probably cover charging of the ovens, largely because the control technology necessary will be demonstrated sooner than the control technology for other stages of coke production. Afterwards, there will be a demonstration of new technology for controlling the emissions from pushing of coke. Standards have been established for conventional slot-oven coke plants; emissions from all new installations cannot exceed the measured quantity emitted by the demonstrated processes. The next step will be to build and demonstrate the capabilities of air pollution control technology applied to a continuous or formcoke plant. Standards established for a continuous coking plant should limit emissions to levels considerably lower than those permitted for slot-oven plants. All coke plants built after the standards are promulgated will not be allowed to emit more pollutants than a well-controlled continuous coke plant emits. By adherence to this program, coke-plant emissions, under Federal legislation, will, by an evolutionary process, be decreased to a level that has been established by the application of the best technology available. (Author conclusions)

17840 APTIC NO. 35734

Ruckelshaus, William D.

ENVIRONMENTAL PROTECTION AGENCY. NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. *Federal Register, 36(242):23931, Dec. 16, 1971.*

Notice is given of public hearings concerning the proposed hazardous emission standards for asbestos, beryllium, and mercury. These hearings are intended to provide an opportunity for interested persons to state their views or arguments or to provide information as to whether these compounds, when emitted to the ambient air, may cause, or contribute to, an increase in mortality or serious illness; and, if so, what standards should be adopted to regulate emissions of such pollutants.

17841 APTIC NO. 35805

Ruckelshaus, William D.

LIGHT DUTY VEHICLE EMISSION STANDARDS. TECHNOLOGY FEASIBILITY. *Federal Register, 36(233):23092, Dec. 3, 1971.*

The Clean Air Act, as amended, requires that 1975 model cars achieve a 90% reduction in the emissions of carbon monoxide and hydrocarbons allowed under 1970 federal standards. The 1976 model cars must achieve a 90% reduction in nitrogen oxides from those emitted by uncontrolled 1971 automobiles. The feasibility of meeting these standards by the specified model years is being studied by the National Academy of Sciences. Because of its immediate concern with the 1975 standards, the Academy is seeking information directly relevant to the technological feasibility of reducing carbon monoxide and hydrocarbon emissions to the specified levels.

17842 APTIC NO. 35974

Ruckelshaus, William D.

TITLE 40 -- PROTECTION OF ENVIRONMENT. CHAPTER 1 -- ENVIRONMENTAL PROTECTION AGENCY. SUBCHAPTER C -- AIR PROGRAMS. PART 60 -- STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. *Federal Register, 36(247):24876-24895, Dec. 23, 1971. 5 refs.*

Pursuant to section 111 of the Clean Air Act as amended, the Administrator of the Environmental Protection Agency has proposed standards of performance for steam generators, portland cement plants, incinerators, nitric acid plants, and sulfuric acid plants. Following a review of the proposed regulations and consideration of the comments from interested parties, the regulations have been revised and are promulgated here. The principal revisions are cited. The following test methods are included: determination of stack gas velocity and volumetric flow rate; gas analysis for carbon dioxide, excess air, and dry molecular weight; determination of moisture in stack gases; determination of particulate emissions from stationary sources; and the determination of sulfur dioxide emissions, nitrogen oxide emissions, sulfuric acid emissions, and the opacity of emissions from stationary sources.

17843 APTIC NO. 35982

Ruckelshaus, William D.

TITLE 40-PROTECTION OF ENVIRONMENT. CHAPTER 1-ENVIRONMENTAL PROTECTION AGENCY. PART 85 - CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLE AND NEW MOTOR VEHICLE ENGINES. *Federal Register, 37(10):669-675, Jan. 15, 1972.*

Miscellaneous amendments and corrections to the regulations for the control of air pollution from new motor vehicles are presented. Emissions standards, test procedures, and maintenance requirements are indicated for hydrocarbons, carbon monoxide, and oxides of nitrogen. Exhaust emissions from 1975 model year vehicles shall not exceed 0.41 gram per vehicle mile hydrocarbons, 3.4 grams per vehicle mile carbon monoxide, and 3.1 grams per vehicle mile oxides of nitrogen. Fuel specifications are mentioned.

17844 APTIC NO. 35406

Ryazanova, V. A. and M. S. Goldberga

MAXIMUM PERMISSIBLE CONCENTRATIONS OF NOXIOUS SUBSTANCES IN THE ATMOSPHERIC AIR OF POPULATED AREAS. *In: Biologicheskoe Deystvie i Gigienicheskoe Znachenie Atmosfernykh Zagryazneniy, p. 185-187, 1966. Translated from Russian. American Institute of Crop Ecology Survey of USSR Air Pollution Literature. A Compilation of Technical Reports on the Biological Effects and the Public Health Aspects of Atmospheric Pollutants, vol. 8:149-152, 1971.*

NTIS: PB 201459

Maximum allowable concentrations are presented for 55 contaminants in the atmosphere. A formula is given to calculate the concentrations for certain groups of substances when they occur together in the atmosphere sulfur dioxide and sulfuric acid aerosol; hydrogen sulfide, hydrogen disulfide, and Dowtherm; isopropylbenzene and isopropylbenzene hydroperoxide; ethylene, propylene, butylene, and amylene; and strong mineral acids.

17845 APTIC NO. 35646

Speight, Frank Y. and F. S. Mallette

STANDARDIZATION ASPECTS OF AIR POLLUTION CONTROL. *Ind. Eng. Chem., 48(9):69A-70A, 72A, 74A, Sept. 1956. 16 refs. (Presented at the American Chemical Society, Delaware Valley Region Meeting, Feb. 16, 1956.)*

Standardized techniques and criteria are increasingly necessary for measuring the degree of air pollution and maximum concentrations allowable. Quantitative and objective standards are also needed that can be used or cited in air pollution ordinances and laws. National organizations concerned with standards are the American Standards Association, American Petroleum Institute, Air Pollution Control Association, American Society of Mechanical Engineers, American Iron and Steel Institute American Meteorology Society, and the American Society for Testing Materials. The activities of each organization are reviewed. To illustrate, the development of a measurement standard, particular attention is given to the evolution of the ASTM method for continuous sulfur dioxide analysis. Comparison is made between U. S. maximum allowable concentrations, established by the ASA, and Russian maximum allowable concentrations, which are much lower than U. S. standards.

17846 APTIC NO. 35146

Suzuki, Takeo, Kiyofumi Ishikawa, and Hiroshi Yamamoto

DATA AND EXAMINATION FOR ESTABLISHING SULFUR OXIDES EMISSION STANDARD. *(Aryusan gasu io sankabutsu no kankyo kijun settei no tame no shiryo to kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(3):315-357, Sept. 1971. 124 refs.*

The policies of the World Health Organization, the governments of the United States, West Germany, Russia, and Japan with regard to establishment of environmental standards are reviewed briefly. The actual methods of establishing standards in the United States, California, Sweden, Russia, and West Germany are discussed in more detail. The influences of sulfur dioxide and sulfur trioxide are discussed generally with regard to human respiratory systems, animal bodies, olfactory threshold, and eye damage. The effects of SO2 on human and animal health have been studied during many experiments. Some of the major experiments are listed with compilations of facts and observations, methods of measurements, concentrations (seasonal, annual, maximum, monthly, or daily average), coexisting elements (such as nitrogen dioxide, suspended particulates settling particles, sulfides, ammonia, hydrogen sulfide, and chlorine), descriptions of effects on health, and the names of researchers. Environmental standards should be set for each specific area in order to control and prevent bad effects on health and disturbances of normal living and to provide the standard for sound judgment of what is to be done towards emission control.

LEGAL AND ADMINISTRATIVE

17847 APTIC NO. 35101

Ministry of Commerce and Industry (Japan), Dept. of Environmental Pollution

SURVEY ON AIR POLLUTION PREVENTION. *(Taiki osen boshi no taiyo). Text in Japanese. In: A Survey of Industrial Pollutant Disposal Machines - 1971. p. 1-14, Dec. 1970.*

The Air Pollution Control Law passed in May 1968 and enforced in December is reviewed with regard to its characteristics, evaluation of areas designated as special control areas, emission standards, special emission standards, and emergency treatments. Sulfur dioxide emission standards of the old and the new laws are given. Emission source classifications are discusssed. Standards for soot and particulates, special toxic materials designated by law, the number of soot emission sources according the cities and types of furnaces, and electric and gas power statistics according to cities are also mentioned. Content of investigations carried out before estimating the total effects of industrial pollution, types, areas, characteristics, methods, and the promotion of air pollution abatement by desulfurization are some of the major topics discussed.

17848 APTIC NO. 35135

THE ENVIRONMENT. THE PROBLEM OF SAFEGUARDING THE AIR, THE SOIL, AND THE WATERS. *(L environnement c est le probleme de la sauvegarde de l air, de la terre et des eaux). Text in French. Les Ind. Mec., 11(875):7-8, Feb. 1971.*

Atmospheric carbon dioxide level has increased by 14% in the last century. Each year six million tons of pollutants are discharged into French streams. Noise pollution is responsible for 70% of all neuroses, for 11% of all industrial accidents, and for 15% of all work days lost. Yearly 600,000 cars are put out of commission while only half that number are properly disposed of. The public must be made aware of these facts and asked to cooperate. The newly established Department of the Environment will have to intervene in many spheres of the economic life, but the means put at its disposal for this purpose (20 million dollars) are inadequate. A number of laws currently can be used to control pollution in streams, in the atmosphere, and noise pollution as well. The polluters should pay for the cleanup, and it is estimated that the cost will amount to from five to ten percent of the cost will amount to from five to ten percent of the cost of goods and considerably more in some sectors (utilities). Since this could affect the competitive position of French industry, pollution control measures will have to be coordinated on an international scale. All ameliorative steps will have to be taken fast before a point of no return is reached.

17849 APTIC NO. 35137

Ministry of Commerce and Industry (Japan), Dept. of Environmental Pollution

A SUMMARY OF SUBSIDIES AND LOANS FOR INSTALLATIONS OF INDUSTRIAL POLLUTION CONTROL FACILITIES. *(Sangyo kogai boshi shisetsu ni taisuru josei seido no gaiyo). Text in Japanese. In: A Survey of Industrial Pollutant Disposal Machines - 1971. p. 28-65, Dec. 1970.*

Various means of governmental subsidies and loans, and private loans made available for air pollution control installations to industries and local self-governing bodies are surveyed. Tax exemption, deduction, and special redemption systems for facilities and properties for pollution control are reviewed; the method of application for such loans, interest, conditions, and qualifications are explained; actual communal or individual pollution control system installations and subsidies and loans made by various organizations are reviewed by tables. Of the total loans made to large, medium, and small industries and local public organizations for pollution control measures, those for air pollution control systems alone occupied 51.6% of the total figure for 1965, 9.5% in 1966, 55.6% for 1967, 54.4% for 1968, and 54.5% for 1969. Of the loans made from 1965 to 1969, 45.7% were for air pollution alone, another 16.2% were for a combination of air and water treatment systems, and 32.2% were for water pollution alone.

17850 APTIC NO. 35151

Ministry of International Trade and Industry (Japan), Public Nuisance Security Bureau

POLLUTION CONTROL POLICY OF THE MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY FOR 1972. *(Showa 47-nendo no Tsusho sangyo-sho no kogai taisaku ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 7(10):617-626, Oct. 1971.*

The 1972 public nuisance control policies and measurement program by the Ministry of International Trade and Industry are discussed with regard to the Ministry s budgets for: investigation and guidance, development of control techniques, expansion of assistance given to industrial pollution control activities, and the promotion of desulfurization systems, industrial waste disposal systems, and small and medium size industries pollution control measures. The total budget for guidance and investigation is $1.147,000, of which the budget for the guidance and education of stack gas treatment technicians is $24,800, and the budget for investigation of industrial complexes for bad odor is $21,100. About $4,061,000 is to be spent toward the development of electric cars and $31,000 for investigation, calibration, and standardization of air pollution measurement instruments. For installations of desulfurization systems, $28,210,000 will be given as subsidies to industries; $15,500,000 will be spent to eliminate lead from gasoline; and $10,540,000 will be spent for installations of electric power generators using liquified natural gas. Import duties are to be decreased approximately $1.55/kl of desulfurized oil, and 34 cents kl of low sulfur crude oil.

17851 APTIC NO. 35358

New Zealand Board of Health, Wellington

AIR POLLUTION. *Rept. Ser. no. 15, 91p., Aug. 1970. 24 refs.*

The present state of air pollution in New Zealand is reviewed. Geographical considerations and the distribution of industry are cited. Agriculture, organic wastes, geothermal activity, fuels, transportation, and the chemical industry are considered. Legislation, air pollution committees, clean air bills, and new resources available for air pollution control are discussed. Proposals for revised legislation are mentioned. Sources of information on present air quality, air quality reference standards, and measurements of particulates and sulfur oxides are considered.

17852 APTIC NO. 35425

Council on Environmental Quality, Washington, D. C

ENVIRONMENTAL QUALITY THE SECOND ANNUAL REPORT. *360p., Aug. 1971.*

Economic and legal aspects of enviromental quality are examined in depth and the status of and trends in environmental quality particularly among the States, since the Councils first report in 1970 are reviewed. Environmental problems in the inner city are discussed. Reorganization of the Environmental Protection Agency is described, including various air quality and water quality programs. Land use, pesticide control, federal environmental research, and congressional action are included. International activity is considered, and citizen action is noted.

17853 APTIC NO. 35461

91st Congress

LEAD-BASED PAINT POISONING PREVENTION ACT. *P. L. 91-695, 3p., Jan. 13, 1971. 7 refs.*

The Lead-Based Paint Poisoning Act authorizes the Secretary of Housing and Urban Development to establish a Federal demonstration and research program for the study of lead-based paint poisoning and requires the Secretary of Health, Education, and Welfare to prohibit future use of lead-based paint in Federal or federally assisted construction or rehabilitation. The Act also provides Federal grants to help cities and communities establish intensive local programs for detecting and eliminating the causes of lead-based paint poisoning. Grants for detection programs are not to exceed $3,330,00 in fiscal year 1971 and $6,660,000 in fiscal year 1972. Grants for elimination programs are not to exceed $5,000,000 in fiscal year 1971 and $10,000,000 in fiscal year 1972. Appropriations for the Federal demonstration and research program are $1,670,000 for fiscal year 1971 and $3,340,000 for fiscal year 1972.

17854 APTIC NO. 35511

Ministry of International Trade and Industry (Japan), Agency of Industrial Science and Technology

INDUSTRIAL POLLUTION CONTROL TECHNICAL RESEARCH BASIC PLANS (PILOT PLANS). *(Sangyo kagai boshi gijutsu kenkyu kihon keikaku (shian)). Text in Japanese. 17p., 1971.*

Various projects on industrial pollution control to be conducted by various institutions under the Agency of Industrial Science and Technology, Ministry of International Trade and Industry are reviewed in a table form for 1971. Research themes, brief descriptions of projects, purposes, and organizations in charge are given. Projects concerning automotive emissions include: methods of testing engine exhausts, methods for analysis of aldehydes, the influences of exhaust gas on air pollution, improvement of fuels, and the development of catalytic converters, small high power diesel engines, and lithium batteries. Projects concerning emission control of nitric oxide from stable combustion sources include: research for controlled combustion techniques, methods of elimination of toxic matter from stack gases, and development of catalysts. Studies on stack gas dispersion include: on-site turbulence mechanism, simulation with wind tunnels, and simulation using computers. Studies concerning measurements include: development of toxic gas analyzers, dust particulate measuring methods, and odor component measuring methods.

17855 APTIC NO. 35667

Kyoto Inst. of Public Health (Japan)

EXAMINATION OF PUBLIC NUISANCE. MANAGEMENTS OF COMPLAINTS ABOUT PUBLIC NUISANCES. *(Kogai kankei kensa. Kogai kujo shori). Text in Japanese. Kyoto-shi Eisei Venkuysho Eiken Nenpo (Annu. Rept. Kyoto City Inst. Public Health), no. 34:66-67, March 1969.*

Registered complaints and treatment for water and air pollution were tabulated. A total of five on-location investigations and 96 water tests were conducted for 24 complaints on water pollution. Complaints were made mostly during the summer months (May, June, and August). Emission sources included wastewater from dye factories, food factories, and chemical drug factories; stagnant swimming pool water; waste purification treatment tank; and storage battery factory waste water. Seven complaints were registered about air pollution involving, 25 personnel, seven on-location investigations, and six air tests. Air pollution emission sources included a tetron film coloring factory, automobile exhaust gas, and a chemical drug factory.

17856 APTIC NO. 35774

Estados Unidos Mexicanos

FEDERAL LAW FOR THE PREVENTION AND CONTROL OF ENVIRONMENTAL POLLUTION. *(Ley federal para prevenir y controlar la contaminacion ambiental). Text in Spanish. Salud Publica Mexico, 13(2): 249-253, March-April 1971.*

A new law for the prevention and control of environmental pollution, in Mexico, prohibiting the discharge into the air of pollutants which may be harmful to human health, flora, and fauna, is examined. Pollutants included are dust, vapors, fumes, gases, and radioactive materials, emitted by both natural and artifical (industrial or technological) pollution sources, including factories, boilers, thermoelectric works, refineries, chemical plants, laboratories, internal combustion engines and automobiles, airplanes, locomotives, boats, and incinerators. Provisions are included for water and soil pollution. Penalties for infractions range from fines to temporary or permanent closing of the facilities responsible for environmental pollution.

17857 APTIC NO. 35888

AIR POLLUTION ALARM IN NEW YORK. *(Luftverschmutzungsalarm in New York). Text in German. Deut. Med. Wochschr., 96(47):1853, Nov. 19, 1971. 1 ref.*

Three air pollution alert stages were created for New York State. The following minimum concentrations characterize the three stages. an average concentration of 0.30 ppm sulfur dioxide for six hours (alert I), of 0.50 ppm (alert II) and of 0.60 ppm (emergency); a 24 hour average particle concentration of 3.0 coefficients of haze units initiates alert 1, of 6.0 Coh-units starts alert II, and of 8.0 starts emergency. The 24 hour concentrations of SO2 and particulates triggering the various alert stages are 0.50, 1.60, and 2.00 ppm Coh-units in a 1000 feet high air column. The values for carbon monoxide are 15, 30, or 50 ppm; for oxidizing compounds (which developed the effect of ultraviolet radiation on nitrogen dioxide and further complex reactions with hydrocarbon compounds) a four hour average concentration of 0.15, 0.25, or 0.40 ppm begins the alerts. At alert stage I, usually older persons with severe chronic pulmonary diseases are affected; at alert stage II, eye irritation and respiratory difficulties of all sensitive persons may occur; during the emergency, the number of affected persons rises further.

17858 APTIC NO. 35664

Abramo, Samuel V.

ENVIRONMENT AND HEALTH. AIR QUALITY ACT OF 1967. *Delaware Med. J., vol. 42:84A, March 1970.*

Delaware adopted ambient air quality standards for sulfur oxides and particulates in November 1969. These standards and a great portion of the present effort to abate air pollution in Delaware result from the complex Air Quality Act of 1967. Presently, the Delaware Water and Air Resources Commission is developing, pursuant to the Air Quality Act of 1967, implementation plans to enforce the new air quality standards.

17859 APTIC NO. 35105

Allemann, J. A.

FUNDAMENTALS OF THE AIR POLLUTION ACT. *(Grondslagen van de Wet inzake de luchtverontreiniging). Text in Dutch. Tijdschr. Soc. Geneesk., 49(21):743-749, Oct. 22, 1971. 7 refs.*

The Air Pollution Act creates the possibility to eliminate air pollution from all sources including industries, households, heating systems, and traffic. The meaning and the fundamentals of the Act are described. An advisory committee to deal with air pollution was formed at the ministrial level. The Act catagorizes the pollution aspects into four sectors: industrial installations, fuels, anti-pollution treatments, and equipment. Guidelines for each sector are given. The industrial installations are dealt with in detail. On the strength of this Act, special measures are to be taken in case of emergencies by the pollutant industries and the local and regional authorities. By general guidelines of the Act, provision is made to create an air pollution measuring network. Those areas and districts, where serious air pollution occurs regularly, are now allowed to be controlled. The execution of the Act is financed by special levies to be paid for by the polluters.

17860 APTIC NO. 35701

Bouquiaux, J. and J. Grandjean

PRINCIPLES AND METHODS OF STUDY OF THE ENVIRONMENT IN BELGIUM. *(Principes et methodes d etude de l environment en Belgique). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 23(324):468-476, Nov. 1970. 5 refs.*

Median monthly levels of sulfur dioxide and other environmental chemical parameters have been measured in Belgium since 1956 as part of an international West European network comprising 100 stations. Since 1967, daily SO2 and particulate levels have been measured by a network organized along the lines recommended by the Organisation de Cooperation et de Developpement Economique. On March 1, 1970 this network consisted of 180 stations, with 50 more stations to be established. SO2 is determined acidimetrically, particulates reflectometrically. Measurement is automatic; samples are collected once a week. Data are processed by an IBM 360-44 computer, published monthly, and entered on maps of five large industrial concentrations in the form of isopollution lines in micrograms/cu m air. The maps reveal a close correlation between SO2 and particulates. The amplitude of variations is small in summer, large in winter. Maximum levels occur in winter as a result of domestic heating. No valid statistical interpretation is possible to date because of the short monitoring period.

17861 APTIC NO. 35724

Cawley, Charles

THE MELCHETT LECTURE FOR 1967. SOME ASPECTS OF FORMULATING A NATIONAL FUEL POLICY. *J. Inst. Fuel, 42(331):315-321, Aug. 1968. (Presented at the Institute of Fuel, London, England, May 22, 1968)*

Formulation of a national fuel policy depends on such relevant factors as availability of all forms of energy, the availability of capital for production and transportation of the different forms, the security of supplies, the impact of demand for alternative forms, and technical developments in each field. The present status of research and development in the fields of coal, oil, natural gas nuclear power, and conventional power is reviewed. Future trends are noted, as is the potential effect on coal usage and fuel-oil desulfurization by the public demand for clean air. Also discussed is the problem of distribution of North Sea gas. Electric power production is also mentioned.

17862 APTIC NO. 35385

Dowdy, W. L., G. E. Clark, and R. G. Crum

A TOTAL-SYSTEM VIEW OF ENVIRONMENTAL MANAGEMENT. *Canaveral Council of Technical Societies, Cocoa Beach, Fla., Technol. Today Tomorrow, Seventh Space Congr., Proc., Cocoa Beach, Fla., 1971, p. 9-5 to 9-22. (April 22-24.)*

The present approach to restoring the quality of the environment must be replaced by a long-range plan that will lead to an effective solution of the total environmental-quality problem. The major elements (air, land, and water) must be treated as a total system. Environmental problems should be identified as their source. Regional agencies should be established to deal with problems within the natural boundaries of their source, and desired quality levels for each region should be determined. The standards required to assure the desired quality must be established and updated. Also, the cost/benefit relationship for alternative standards should be determined. Determining the action necessary to implement the best alternative, and monitoring to assure that air quality standards are met are also important. (Author summary modified)

17863 APTIC NO. 35675

Engles, G.

THE NEW REGULATIONS REGARDING PROTECTION AGAINST EMISSIONS AND OCCUPATIONAL HAZARDS AND THEIR EFFECTS ON FOUNDRIES. *Giesserei (Duesseldorf), vol. 56:621-624, Oct. 9, 1969. 14 refs. Translated from German. British Iron and Steel Industry Translation Service, London (England), 9p., 1970.*

Limits on cupola dust and gas emissions set by the Clean Air Law of 1959 are summarized and more recent regulations are discussed. These concern new requirements for dust extraction from cupolas and nonferrous melting furnaces, noise reduction, working safety, accident prevention, and clean air in work places. Various emission and air quality standards are mentioned.

17864 APTIC NO. 36023

Frankel, Richard J.

ENVIRONMENTAL QUALITY CONSIDERATIONS IN PLANNING THE FUTURE OF THE COAL-ELECTRIC POWER INDUSTRY. *Atmos. Environ., 5(12): 1051-1056, Dec. 1971. 3 refs.*

Public policies governing fuel quality, emissions, and environmental quality standards affect substantially the future choice of sources of supply and the competitive position of the various fuels to produce electric power. Research was undertaken to delineate policy alternatives and to place in a new perspective the importance of environmental quality control measures in planning for electric power growth and development. A methodology is described for measuring the implications of alternative environmental quality decisions on the coal electric energy industry. This industry was chosen because of its size in the United States, its importance in the United States economy, and its association with many residual waste streams. The framework for analysis, the general model, and some preliminary conclusions are given. Costs for environmental control are discussed. (Author abstract)

17865 APTIC NO. 35922

Fujitani, Yoshiyasu

AIR POLLUTION: MEASUREMENT AND CONTROL MEASURE. *(Taiki osen, keisoku to taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 6(1):27-30, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)*

Sulfur oxides, particulates, carbon monoxide, hydrocarbon, and nitrogen oxide concentrations and their emission sources are presented for the U. S. in 1966. The U. S. monitoring system is briefly discussed. An automobile maker in Nagoya began an investigation in April 1970, and after one year of preparation, obtained monitoring apparatus and began a two-year continuous monitoring of two cars and two fixed monitoring stations in Nagoya. Sulfur dioxide, dust, nitric oxide, nitrogen dioxide, CO, HC, oxidant, and lead are being measured; the wind direction, velocity, temperature, humidity, the quantities of the sunshine, and precipitation are also measured. Traffic, pollutant concentration, and correlation between pollution, traffic, and meteorological factors will be examined. The patterns of pollution and high fluctuation, if any, will be determined at busy intersections and in Nagoya city as a whole. The method of forecasting will be developed by simulation tests.

17866 APTIC NO. 35088

Fulton, Maurice

NEW FACTORS IN PLANT LOCATION. *Harvard Bus. Rev., 49(3):4-6, 8-10, 14-17, 166, 168, May/June 1971. 7 refs.*

Problems of plant location, with emphasis on changing factors and trends, are reviewed with respect to labor force, community size, transportation aspects, water pollution, air pollution, land for building, fuel and power, tax levies, financing opportunities, role of the government, and international considerations. Although plant location decisions in this decade will continue to be predicated on economic factors, with maximization of profit a major objective, few decisions can be made without consideration of these factors. The impact of location and development on the environment will be especially critical.

17867 APTIC NO. 35817

Gavelin, Gunnar

AIR AND WATER POLLUTION REGULATIONS AND CONTROLS IN SWEDEN, Paper Trade J., 156(2):38-39, Jan. 10, 1972.

Air pollution abatement problems in Sweden are handled by the National Environmental Protection Board (NEPB), established in 1965. The role of the NEPB is defined in a 1969 environmental protection law which forbids any pollution that is technically and economically possible to avoid. A franchise board decides what measures must be taken, and failure to abide by its instructions results in fines or imprisonment for up to one year for persons responsible. Unless exempted by a NEPB license, all pulp and paper mills must apply to the franchise board for permission to use sewer water and emit gases to the atmosphere. NEPB recommendations lack the legal status of a franchise board permission, but are usually just as stringent. Many mills prefer to apply to the NEPB because a constructive dialogue with technical experts is possible. Enforcement of the stipulations in franchises and licenses are entrusted to local authorities, who require monthly reports from every mill. Pollution abatement investment costs of older industries are subsidized by the NEPB. New industries are expected to make atatement an integral part of their operation and receive no subsidies. Research in air and water pollution is a joint effort of industry and government, both sponsors of the Forest Industry Research Foundation for Air and Water Protection.

17868 APTIC NO. 35626

Geny, M.

PROBLEMS OF AIR AND WATER POLLUTION ENGENDERED BY THE STEEL INDUSTRY. *(Problemes de la pollution de l air et de l eau en relation avec l industrie siderurgique). Text in French. Preprint, Association Technique de la Siderurgie Francaise, Paris (France), Commission Eau et Pollution Atmospherique, 4p., 1968. (Presented at the Association Technique de la Siderurgie Francaise, Commission Eau et Pollution Atmospherique Meeting, Geneva, Switzerland, March 14-15, 1968, CT/MTP Service 526 No.E-PA 68-54.)*

The Committee for Steel of the Economic Commission for Europe has decided to include among its work projects for 1967-8 a study of air and water pollution caused by the steel industry. A special international group of experts to discuss various problems. The following were studied: problems posed by oxygen blast converters, cost of purification installations, data on fritting, purification, and galvanization, pollution from high furnaces caused by wear, leaks, and other kinds of deterioration, dust control and disposal from Kaldo furnaces, coke oven charging and discharging, the effect of pressure at the top of high furnaces, water purification in various types of rolling mills, electric furnaces and the manufacture of ferro alloys, pelletizing installations, dry coke extinction, agglomeration of mineral frit with a high sulfur content, purification of gases from high furnaces, and costs of different dust arrester systems. Pollution from Martin furnaces, water purification in cokeries, electric furnaces used in steel making, and pollution from electric ovens processing pig iron were also studied.

17869 APTIC NO. 35694

Gray, Albert Woodruff

LEGAL ASPECTS OF AIR POLLUTION. *Air Eng., 4(3):29-31, March 1962. 5 refs.*

Case histories were given to answer legal questions about when an odor constitutes an actionable nuisance. A permit is no legal sanction for conducting a business that is a public nuisance. In California, the legal use of the Ringelmann chart was established; it says a person shall not discharge smoke or contaminants as dark or darker in shade than that designated No. 2 on the Ringelmann chart. Smoke from ships is in the province of local governments. Congress recognized that the problem of air pollution is a matter of state and local concern. A court maintained that there is no overlap between the scope of the federal ship inspection laws and that of municipal ordinances.

17870 APTIC NO. 35628

Hammje, Klaus and Karlwilhelm Horn

THE TASKS OF THE PUBLIC HEALTH SYSTEM OF THE GERMAN DEMOCRATIC REPUBLIC IN THE FIELD OF THE HYGIENE OF THE AIR. *(Die Aufgaben der Hygieneinspektionen der DDR auf dem Gebiet der Lufthygiene). Text in German. Wiss. Z. Humboldt Univ. Berlin Math. Naturw. Reihe, 19(5):553-556, 1970. 11 refs.*

In the German Democratic Republic, the air pollution control program is administered by the public health system. The technical development of dust removal and waste gas purification systems, study of meteorological factors, and other related areas are co-ordinated by the Research Council of the GDR. In recent years, a close co-operation with other countries, in particular the USSR, has been achieved. A complete set of laws concerning air pollution and purification does not yet exist, although guidelines for maximum permissible emissions of pollutants and maximum emission values have been established to an appreciable extent. The district institutes for hygiene are responsible for measuring actual concentrations in their areas on a regular and systematic basis. They recommend preventive measures in the interest of public health, and cooperate in site selection for new industries. Emissions are being established in terms of cumulative values for 15 minutes and 24 hours for whole territories, based on a network of measuring points, as well as for areas comprising individual industrial plants and their immediate vicinity. A new industrial plant, in order to be approved, must have equipment for limiting and dispersing pollutants, and the emission values of the area and vicinity of the new installation must not exceed approved maxima. If this cannot be achieved with gas purification, other measures have to be considered, such as change of fuel, stack height, or production limitations.

17871 APTIC NO. 36022

Harrison, D.

ONTARIO HYDRO S AIR-POLLUTION-CONTROL RESEARCH PROGRAM. *Ont. Hydro Res. Quart., 23(2):i-iv, 1971.*

Ontario Hydro s air pollution control and research program began in 1958 when air pollution surveys were set up at two coal fired generating stations in the Toronto area on the north shore of Lake Ontario. The air pollution control and research program can be divided into four parts: chemical analyses and measurements of pollutants released from the stations; studies of the diffusion and dispersion of pollutants in the atmosphere; surveys of air quality in the vicinity of coal-fired generating stations; and the development of control processes that minimize the release of pollutants. Major efforts are also being made to assess biological effects of warm water discharged from generating stations, to improve the visual appearance of structures and installations, and to keep noise levels from equipment and operations within acceptable limits.

17872 APTIC NO. 35850

Hauser, Edwin W., Leonard B. West, Jr., and A. Richard Schleicher

FUNDAMENTAL AIR POLLUTION CONSIDERATIONS FOR URBAN AND TRANSPORTATION PLANNERS. *Traffic Quart., 26(1):71-84, Jan. 1972. 5 refs.*

Urban planning and development processes, of which transportation engineering and planning are an important part, involve a combination of several interrelated disciplines engaged in a continuous program to systematically plan for the development and renewal of our cities. These processes are ordinarily designed to reflect the community s social, economic, and physical goals, potentials, and problems. Interrelationships which exist between urban and transportation planning and air pollution control are varied and complex. Many human and physical elements involved in the process of urbanization are pollutant generators. According to one estimate, one-half of the hydrocarbons, one-third of the oxides of nitrogen, two-thirds of the carbon monoxide, and nine-tenths of the lead-bearing particulate emissions in the air are caused by exhaust and evaporation from motor vehicles. Basic issues for urban and transportation planning involve working relations with state and local air pollution control authorities, a knowledge of the distribution of pollutants within an area and the prevailing meteorological factors, the use of diffusion models, and better understanding of the nature and use of motor vehicles. Planning processes are discussed, as well as some interrelationships.

17873 APTIC NO. 35698

Henz, Donald J.

THE RINGELMANN NUMBER AS AN IRREBUTABLE PRESUMPTION OF GUILT - AN OUTDATED CONCEPT. *Nat. Resour. Lawyer, vol. 3:232-240, May 1970. 14 refs.*

While judicial acceptance of the Ringelmann Chart has been based on its long use rather than scientific considerations, many law-making bodies have failed to take notice of that fact. Instead they see Ringelmann as a handy tool for measuring guilt. Since it is awkward and time-consuming to set up a chart for each observation, the charts are used only for training, after which the observer depends on memory to judge plumes and classify them according to Ringelmann number. The Ringelmann Chart does not limit the tonnage of each pollutant with some degree of specificity, and is therefore not appropriate for the protection of clean air. Statutes and ordinances which provide for prosecution solely on the basis of a Ringelmann reading, without regard to lighting conditions, wind velocity, and smoke stack diameter, may be held unconstitutional because such a visual test is an unreasonable method of determining emission pollution content in view of the present state of the art.

17874 APTIC NO. 35777

Hiramatsu, Akio

THINKING IN LOCAL PUBLIC NUISANCE CONTROL PLANS IN THE NAGOYA AREA AND OTHERS. *(Nagoya-to, chiiki kogai boshi keikaku no kangae kata). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 6(1):42, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)*

The Aichi Prefecture is in the process of forming specific plans and programs for pollution control for the Nagoya and other polluted areas to be carried out after 1972. These areas contain of textile, machinery, and ceramic industries along the harbor of Nagoya. An outline comprises the setting of goals in terms of achievement and duration, a long term policy and the setting of priorities, and an organic incorporation of the program with the national policy. Some of the programs will concern the control of fixed emission sources and the control of automotive pollution.

17875 APTIC NO. 35859

Hore, F. R.

POLLUTION LEGISLATION IN CANADA AFFECTING THE LIVESTOCK INDUSTRY. *Preprint, American Society of Agricultural Engineers, Saint Joseph, Mich., 13p., 1971. 4 refs. (Presented at the American Society of Agricultural Engineers, Winter Meeting, Chicago, Ill., Dec. 7-10, 1971, Paper 71-920.)*

Air pollution legislation affecting the livestock industry in Canada is summarized. The Fisheries Act controlling water wastes and regulations concerning pollutant emissions, feedlot operations, pig keeping, transport of animal waste, and emissions from manure are reviewed. Legislation pertinent to the industry or with exemptions pertaining to the industry is examined for the individual provinces.

17876 APTIC NO. 35718

Iseki, Kotaro

PUBLIC NUISANCE CONTROL MEASURES AND CITY PLANNING. *(Kogai boshi keikaku to toshi keikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan Society Air Pollution), 6(1):41, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)*

Most industries presently located in urban areas desire to move out of cities. In selecting new sites for these industries, the following factors should be considered for the future pollution prevention: Local weather conditions, characteristic land and sea breezes, and the down drought pattern. Along the coastal areas where land and sea breezes are prevalent, the pattern of pollutant dispersion fluctuates within a day. The pollution distribution varies from the day when inland is most heavily polluted to the night when pollution usually moves out to the sea in these areas. The smog front patterns must be studied. The down drought or down-wash occurs with a sudden gale in highly polluted areas. The planning of residential area attached to the industrial population must avoid areas where down drought habitually occurs. The creation of parks and green areas as buffers is effective.

17877 APTIC NO. 35752

Ishiguro, Tatsukichi

THE DIRECTION OF ODOR CONTROL AND REGULATIONS. *(Akushu kogai no genjo to kisei no hoko). Text in Japanese. Japan Society of Efficiency, Tokyo, Chem. Plant Eng. Conf. Proc., Tokyo, Japan, 1971, p. 2-1-1 - 2-1-17. (Oct.)*

Some difficulties and trends of odor control methods are examined. The lack of objective methods for evaluating odors and established method of analysis; the complex composition of odors; effectiveness of control methods, which demands the elimination of more than 99.9% odors; costs; and distribution methods are discussed. The function of the control agency include the designation of offensive odors, their sources, control methods, and standards for concentrations. The entire industry, as opposed to a specific source, and the entire classification, as opposed to the individual operation, must constitute the objects of control. Before establishing future policies, the designated 13 odor-producing materials should be re-examined; measurement methods, limited to the low-temperature condensation method and gas chromatography, must be evaluated and expanded; the role of local opinion and government agencies, with respect to standards, laws, enforcement procedures, and financial measures, must be investigated. Data on complaints of offensive odors and odor sources are presented.

17878 APTIC NO. 35362

Ixfeld, H.

THE SUPERVISION AND MEASUREMENT OF ATMOSPHERIC POLLUTION IN THE RHINE-NORTH WESTPHALIA REGION. *(Methodes pour la surveillance et la determination de la pollution de l air atmospherique dans la region Rhin Nord-Westphalie). Text in French. Tribune CEBEDEAU Centre Belge Etude Doc. Eaux), 23(324):477-481, Nov. 1970.*

The air quality measurement network operating for the past several years in an area covering 6000 sq km, encompassing the heavily industrialized Rhine and Ruhr regions, is described. One hundred and four individual measurements of sulfur dioxide emission levels are taken each year for each square kilometer of the territory by a network of measurement stations. SO2 sampling is conducted from mobile vans using the Stratmann silica gel method, in which the SO2 absorbed by the silica gel is converted in the laboratory to hydrogen sulfide by a glowing platinum contact in a current of hydrogen at 600 C. With a solution of ammonium molybdate in the presence of H2S04, H2S forms molybdene blue which is then measured photometrically. The SO2 measurements obtained each year are processed electronically. Particulates are measured by the Bergerhoff device at 1.5 to 1.7 m above ground. SO2 concentrations are also measured continuously in 12 industrial cities of the region. Generally SO2 values at ground level are below 1 mg/cu m. Whenever this concentration reaches 5 mg/cu m, pollution alert I is transmitted to polluters who then reduce their operations. When the critical concentration is exceeded and is expected to persist for 24 hours, alert II is declared; all industrial activity and automobile traffic are then halted. Plans to expand the program are outlined.

17879 APTIC NO. 35149

Kaino, Michitaka

TOKYO MUNICIPAL RESEARCH INSTITUTE FOR ENVIRONMENTAL POLLUTION AND I - A PERSONAL VIEW. *(Watashi to Tokyoto kogai kenkyujo). Text in Japanese. Tokyo Metropolitan Public Nuisance Research Inst. (Japan), Dept. of Investigation, Tokyo-New York Environ. Pollut. Symp., Proc., New York, 1970, p. 5-13. (April 13-15.)*

The maintenance of a living environment and the function of the Tokyo Municipal Research Institute for Environmental Protection are discussed. The pollution control law issued in 1967 indicates the basic thinking in definition and control of pollution and its flaws. According to this law, destructive influences of the environment are divided into two categories: When human health is damaged, legal control applies unconditionally; but when animal and plant damage, economic losses, and the encroachment of the living environment are involved, a compromise between the control measures and economics is suggested. However, the damage of animals, plants, and economics have become one definite index for the degree of damage to human health. The 1948 air pollution control law designated the use of high stacks and better dispersion of gases containing sulfur dioxide as methods of SO2 control. These have been proven repeatedly and increasingly as insufficient methods of environmental protection. These matters have led to the issuance of the Tokyo Metropolitan Pollution Control Ordinance and Enforcement Act of July 1969.

17880 APTIC NO. 35059

Lacy, Paul

ENVIRONMENTAL PATHOBIOLOGY -- COMBINED APPROACH TO PROBLEM SOLVING AND MANPOWER TRAINING. *Am. J. Pathol., 64(1):217-224, July 1971. (Presented at the Federation of the American Societies for Experimental Pathology. Annual Meeting, Symposium on*

Environmentally Induced Diseases, Atlantic City, N. J., April 15, 1970.)

There is a critical need for more well-trained scientists to work in the field of environmental health and, in particular, a need for experimental pathologists. The continuing flow of anatomic material in autopsy and surgical pathology provides an excellent opportunity to search for the presence of presumedly toxic environmental agents in the tissues and to correlate their presence with the possible production of disease entities in man. In laboratory medicine, body fluids are available from the living patient for chemical determination of circulating levels of possible toxic agents and for biochemical and enzymatic studies to assess the possible pathologic effects of these agents. From the standpoint of training, a knowledge of the anatomic aspects and the natural history of disease entities in man is essential in attempting to establish whether an environmental agent is responsible for a particular disease. The role of pathological techniques in solving environmental problems is discussed, and a program in environmental pathobiology is outlined.

17881 APTIC NO. 35464

Lewis, D. H., S. E. Plotkin, and K. R. Woodcock

SOME APPLICATIONS OF THE IMPLEMENTATION PLANNING PROGRAM. *TRW Systems Group, McLean, Va., Washington Operations, Air Pollution Control Office Contract PH 22-68-60, 219p., April 1971. 9 refs.*

NTIS: PB 203127

Certain applications of the Implementation Planning Program, an air resource management planning tool, were studied. This program includes mathematical models representing the atmospheric diffusion of pollutants, the cost and effectiveness of pollution control measures, and the potential air quality impact of air pollution control strategies upon which legislation may be based. The primary question to be answered is whether or not the IPP can be used to estimate the national level demand for control measures of all types, especially fuel substitution. The validity must be determined of the assumption made in the Cost of Clean Air Report relating emission standards to air quality standards. Input data requirements for IPP in an operational environment must also be determined to find whether or not existing emission inventory data is adequate to run the program. Detailed emission inventories for Cincinnati, St. Louis, and Washington, D. C. are used in several portions of this study.

17882 APTIC NO. 35946

Ludwig, John H.

TECHNICAL NEEDS IN METEOROLOGY FOR OUR AFFLUENT FUTURE: AIR QUALITY. *Bull. Am. Meteorol. Soc., 52(7):534-537, July 1971. 1 ref. (Presented at the American Meteorological Society, Annual Meeting, 51st, San Francisco, Calif., Jan. 11-14, 1971.)*

Meteorologists now have an even greater responsibility and opportunity than previously in contributing their technological input in the development and prosecution of pollution control programs at all levels of governments, and in particular during those adverse weather conditions involving potential danger to human health and welfare. Starting with the basic situation with respect to engineering control technology and fuel availability, it is the aim of all control agencies to achieve optimal control programs and develop effective emergency operations tactics. Specifically, this entails: the designation of the minimum air quality network and its spatial distribution which will provide adequate data for record purposes; the establishment of the quantitative relationship between the emission of pollutants and their subsequent distribution in time and space; the development of planning guides for future land usage which will insure acceptable air quality; and the development of an operational warning system. Regional urban and global problems are also cited, including the acidity of precipitation and thermal pollution of streams.

17883 APTIC NO. 35988

Maximova, V. A.

HYGIENIC ASSESSMENT OF THE PLANNING MEANS OF PROTECTION OF URBAN AIR FROM CONTAMINATION WITH MOTOR TRAFFIC DISCHARGES. *(Gigiyenicheskaya otsenka planirovochnykh sredstv zashchity vozdukha gorodov ot zagryazneniya vybrosami avtotransporta). Text in Russian. Gigiena i Sanit., 36(10):11-13, 1971. 4 refs.*

Motor vehicle exhaust was studied in relation to traffic intensity, meteorological factors, road layout, and adjacent buildings. The level of atmospheric contamination was dependent on traffic intensity and certain meteorological conditions, such as wind rate and temperature. Proper urban planning may decrease the level of contamination from 70-90%.

17884 APTIC NO. 35523

McElroy, W. D.

TITLE 45-PUBLIC WELFARE. CHAPTER VI-NATIONAL SCIENCE FOUNDATION. PART 640-ENVIRONMENTAL IMPACT STATEMENT POLICY AND PROCEDURES. *Federal Register, 36(287):23388-23390, Dec. 9, 1971.*

Before undertaking or supporting any major action that may have a significant effect on the environment, the National Science Foundation will, in consultation with other appropriate agencies, assess in detail the potential environmental impact in order that adverse effects may be avoided and environmental quality restored or enhanced. In particular, alternative actions will be explored and evaluated. Responsibilities, implementation, consultation with other agencies, and public information are outlined.

17885 APTIC NO. 35389

Morgan, George B. and Guntis Ozolins

MONITORING ATMOSPHERIC POLLUTANTS. *Preprint, Air Pollution Control Office, Cincinnati, Ohio, Div. of Atmospheric Surveillance, 17p., 1971. 17 refs. (Presented at the Eascon, 1971.)*

Information on pollutant levels in the ambient air is obtained through the operation of networks of monitoring stations, which range from simple to highly complex. Inventories of sources and emissions are developed by on-site measurements, by compilation of information from questionnaires, and by engineering calculations. Information that defines the diffusion characteristics of the atmosphere is derived from measurements of wind flows, temperatures, and mixing depths. The beginnings of atmospheric monitoring in the United States are discussed, as well as the intensification of monitoring activities which took place with an increased concern with environmental quality. The changing emphasis on responsibility for atmospheric monitoring is mentioned, touching upon programs of the Environmental Protection Agency and its cooperative relationships with State, regional, and local pollution control agencies. Potential developments in monitoring are indicated, citing progress toward accurate and rapid dissemination of air quality data and toward new, more reliable, and more efficient monitoring instruments and techniques.

17886 APTIC NO. 35527

Onda, Masami

THE BASIC THINKING CONCERNING PUBLIC NUISANCE CONTROL MEASURES. *(Kogai boshi keikaku ni kansuru kihonteki kangaekata). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 6(1):40, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)*

An outline for the future public nuisance control planning is given. Damages to be considered are on natural environment, living environment, and human health including genes. Pollutants to be checked are sulfur oxides, suspended particulates, nitrogen oxides, hydrocarbons, oxidants, carbon monoxide, carbon dioxide, fluorides, traceable heavy metals, chemicals, liquid waste, noise, vibration, bad odor, and radiation. Causes are population increase, industrialization, and urbanization. Calculation of environmental capacity (degree of pollution obtained by environmental pollutant emission quantity divided by the environmental capacity), predictions for the future, abatement plans, cost and effect analyses, predictions of economic effects, selection of abatement methods, and determination of priorities are to be examined for the control program. Abatement programs against fixed emission sources, combustion sources, emissions by production processes, and mobile emission sources are to be formulated. Estimated costs for a complete pollution control program are $390,600,000 for the Chiba area, $213,900,000 for the Yokkaichi area, and $219,400,000 for the Mizushima area. The program includes control of all forms of pollution.

17887 APTIC NO. 35872

Parker, A.

WHAT S IN THE AIR? J. Inst. Fuel, 40(315):173-175, April 1967. (Presented at the Fuel Luncheon Club, Dec. 20, 1966.)

The fight for cleaner air in Great Britain is reviewed from the era of industrialization to the present with major emphasis on legislative efforts. Records of smogs in various parts of England exist since 1873, but the London smog in 1952 had a great effect leading to the Beaver Report and the Clean Air Act of 1956. Smoke emissions decreased from 2.7 million tons in 1938 to 1.1 million tons in 1965; of this, domestic sources contributed 63% in 1938 and 80% (0.9 million tons) in 1965. Sulfur dioxide concentrations in the atmosphere increased from 4.1 million tons in 1938 to 6.4 million tons in 1965, but ground level concentrations remained the same. About 14 million motor vehicles emitted about five million tons of carbon monoxide and one-quarter tons of hydrocarbons in 1965. International cooperative efforts for pollution abatement are discussed. (Author abstract modified)

17888 APTIC NO. 35423

Plotkin, S. E. and D. H. Lewis

CONTROLLING AIR QUALITY: ST. LOUIS CASE STUDY. *TRW Systems Group, McLean, Va., Air Pollution Control Office Contract PH 22-68-60, 111p., June 1971. 8 refs.*

NTIS: PB 203063

Three alternate emission control strategies are applied to the St. Louis Air Quality Control Region. The strategies are a conventional set of emission source-category standards, a rollback strategy, and a least-cost strategy. Study results include regional costs, air quality achieved, emission reductions, plots of pollutant concentration levels, and a measure of benefit. A description and brief analysis are presented of a simple procedure by which a diffusion model can be to predict the (air quality) consequences of shifting land use, without incurring the considerable expense of continually re-running the entire model. 0

17889 APTIC NO. 35114

Rebiere, Andre

LEGISLATION AND IMPLEMENTATION IN THE FIELD OF ATMOSPHERIC POLLUTION. *(Legislation et reglementation en matiere de pollution atmospherique). Text in French. Pollut. Atmos. (Paris), vol. 13:60-63, Oct. 1971.*

The law of August 2, 1961 applies to pollution in all its forms. Supplemental legislation and a wealth of regulations stipulate for pollution-exposed zones that coal used must not contain volatile matter in excess of 15%; that light and heavy fuel oils must not be used in furnaces yielding more than 350,500 or 1000 th/h, depending on the nature of the oil and the zone; that the sulfur content in fuels must not exceed two percent, that heating installations with an output exceeding 500 th/h must be operated by trained personnel; that all heating installations with an output exceeding 350 th/h must be annually inspected; and that particulate emission must not exceed 0.6 g/th in zone one or 1.2 g/th in zone two. Polluting industries in zones one and two are subject to municipal authorization which is designed to limit emissions. Uniform regulations governing pollution apply to all of France; prefects cannot deviate from these regulations except in exceptional circumstances. Special regulations apply to height of stacks, to cement factories, to incineration of solid waste, to agglomeration of iron ore, and to other instances. Legislation promulgated on April 7, 1966 regulates combustion installations, a decree of June 22, 1967 regulates steam generators and other thermal generators, a decree of June 10, 1969 introduces a log to be kept by all heating installations. A decree of February 5, 1969 contains regulations applying to automotive emissions, and the regulation of June 30, 1970 stipulates maximal permissible exhaust emissions for internal combustion engines.

17890 APTIC NO. 35983

Rihm, Alexander, Jr.

STATE AND LOCAL AGENCY PARTICIPATION IN FEDERAL AIR QUALITY CONTROL REGIONS. *Am. J. Public Health, 62(1):86-90, Jan. 1972. (Presented at the American Public Health Association, Annual Meeting, 98th, Houston, Tex., Oct. 28, 1970.)*

The 1967 Air Quality Act was designed to protect and enhance the quality of the nation s air resources. It was also intended to encourage and assist states and communities in the development and operation of regional air pollution control programs. The 1967 Act gave the Secretary of Health, Education, and Welfare the power to designate air quality control regions. In addition, the Secretary was made responsible for developing and issuing criteria and information on recommended pollution control techniques. After the Secretary designated a region and published criteria, states within the region were required by Congress to signify within 90 days an intent to adopt standards based on the published criteria. Within another 180 days, the states then had to hold hearings and adopt standards. A plan for implementing, maintaining, and enforcing the standards was then to be submitted to the Secretary within an additional 180 days. The place of state and local agencies with respect to this system is described and proposals are offered for improvement. Special reference is made to New York State.

17891 APTIC NO. 35892

Scorer, R. S.

NEW ATTITUDES TO AIR POLLUTION - THE TECHNICAL BASIS OF CONTROL. *Atmos. Environ., 5(11):903-934, 1971. 11 refs.*

Technical knowledge is needed to establish priorties for air pollution control. It is important to survey each situation to discover which of the practicable means available will be the the most effective, and a procedure for conducting the survey is illustrated in an examination of the basis of the 1956, United Kingdom Clean Air Act. The technical knowledge required lies as much in the fields of local authority administration, economics, and public relations, as in technology and pure science, and there should be a more effective dialogue between politicians and scientists. After considering legislative and other methods, control by practitioners (like the Alkali Inspectorate) is recommended in preference to enforcement through the courts. At the international level water pollution is far more serious than air pollution, but some of the outstanding air pollution problems are considered. The most important is car exhaust. Globally the two greatest problems are the increase in carbon dioxide and the production of particulate haze. Since the pressure for economic growth in the most advanced countries conflicts with the preservation of the environment, the economic forces which direct the development of our society must be changed. (Author abstract modified)

17892 APTIC NO. 35806

Seeber, Lynn

TENNESSEE VALLEY AUTHORITY. ENVIRONMENTAL QUALITY MANAGEMENT. POLICY, DELEGATIONS, RESERVATIONS, AND PROCEDURES. *Federal Register, 36(211):21010-21014, Nov. 2, 1971.*

The text is given of the Tennessee Valley Authority statement of policy and procedures for environmental quality management, approved by the Board of Directors on October 15, 1971. Included are the delegations made by the Board for implementation of the policy, which supersedes that approved on February 25, 1971.

17893 APTIC NO. 35275

Seidl, Walter

MAINTAINING CLEAN AIR IN THE U.S.A. *(Luftreinhaltung in den U.S.A.). Text in German. Umwelt (Duesseldorf), no. 5:28-34, Oct./Nov. 1971.*

The Secretary of Health, Education and Welfare (HEW) is authorized to declare, on a nationwide basis, strongly polluted areas as Air Quality Control Regions (AQCR) which are subject to officially imposed emission limitations. It is also his responsibility to issue Air Quality Criteria (AQC), to arrange for determination of the origin of these emissions, and of the state of the technology for limiting such emissions. The individual states are obligated to issue air quality standards (AQS) in general conformity with the AQC, as well as plans for implementation of these standards, which are subject to approval by the Secretary of HEW. The required documentation for sulfur oxides and dust were issued in 1969; those for carbon monoxide, hydrocarbons, and photochemical oxidizers in 1970; the corresponding documentation for lead, nitric oxides, fluorides, and polycyclic hydrocarbons are to be completed in 1971. By the end of 1970, about 90 metropolitan areas were declared as Air Quality Control Regions (AQCR). In parallel with efforts for keeping the air clean, progress was made in the fight against water pollution and against excessive accumulations of solid waste. In January 1970, the National Environmental Policy Act was issued which established the formation of the Council on Environmental Quality (CEQ) within the Presidents Executive Office. Concerning air pollution conditions in the U.S.A., various tabulations are presented such as a listing of yearly emissions in 1968 totalling 200 million tons, composed of carbon monoxides, dust, sulfur oxides, hydrocarbons, and nitric oxides. Within this grouping, CO represented 47% of all emissions, mostly dervied from automotive traffic. Forecasts for emission characteristics up to the year 2000 indicate a considerable increase in total quantities of sulfur dioxide and nitric oxides, despite improvements in purification methods, due to anticipated further substantial growth in numbers of automotive vehicles and expansion of industries.

17894 APTIC NO. 35921

Shoji, H., T. Suzuki, H. Mimura, H. Mihara, T. Oshio, and K. Miyamoto

PROBLEMS IN POLLUTION CONTROL PROGRAMS: A SYMPOSIUM. *(Kogai boshi keikaku no mondaiten: sinpojiumu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 6(2):271-299, Nov. 1971.*

The basic attitude in Japanese cities toward planning pollution control, a survey of control programs, and the future problems are discussed by various members. Plans for sulfur dioxide control in Tokyo include calculation of the total emission in the city, the calculation of environmental capacity, measurement of environmental concentration, estimation of various factor indexes contributing toward pollution, and the determination of abatement rates to meet the environmental standards. Based on the above investigations, emission standards will be enforced; control measures will be taken against larger areas as single units; fuel consumption will be regulated; area industrialization will be controlled; a control system against emergencies due to weather conditions will be established using computers; systematic administrative guidance will be given to industries with one whole factory as a unit as against one specific emission source; and low sulfur content fuels will be secured. Health problems, local administrative plans, economic aspects of control programs, the use of the land, and city planning in industrial complex areas are discussed.

17895 APTIC NO. 35900

Stairmand, C. J.

THE CHEMICAL ENGINEERS CONTRIBUTION TO AIR POLLUTION CONTROL. *Chem. Engr. (London), no. 254:375-382, Oct. 1971. 17 refs. (Presented to the Institution of Chemical Engineers, Northern Branch, Jan. 14, 1971.)*

The various regulations and acts which govern pollution control in the United Kingdom are outlined from the first Alkali Regulations in 1863 to the present day. Principles of control and the policies on which a greater cost-effectiveness might be based are considered. The decision as to what is the best practicable means rests with the Chief Alkali Inspector, but in making the decision he must consider the present state of technical development, the economics of each particular situation, and the pollution already existing. Costs and efficiency of various dust-collection systems are compared. Fields are suggested in which an effort by chemical engineers should prove rewarding, and trends for the future are discussed. (Author abstract modified)

17896 APTIC NO. 35697

Stauffer, Robert F.

AIR QUALITY STANDARDS - PROCEDURAL PROBLEMS. *Nat. Resour. Lawyer, vol. 3:227-231, May 1970. 1 ref.*

The establishment of air quality standards is now strictly a function of the respective states. Where an Air Quality Control Region overlaps two or more jurisdictions, the means of measuring air contaminants may differ and the quality of equipment and the level of trained personnel may be unrelated. The procedural aspects of the hearings also differ from jurisdiction to jurisdiction. Problems of receiving true and factual testimony, time limits on oral presentations, decorum in the hearing room, the number of witnesses seeking to testify, and the order of their appearance are discussed. A uniform hearing procedure administered by a professional hearing officer is recommended.

17897 APTIC NO. 35943

Syrota, J.

THE INDUSTRY AND THE ENVIRONMENT. *(L industrie et l environnement). Text in French. Ann. Mines (Paris), 10:29-42, Oct. 1971.*

Industrial pollutants, their control, and the effects of pollution control measures on the economy are discussed. Pollution control has become a public crusade, with the result that sulfur dioxide levels in the atmosphere of Paris have been reduced by 30% during the past five years. The fight against pollution is contingent with continuing intensive research about its effects on health. The government has created a new Ministry for the Protection of Nature and of the Environment. Several laws, namely the modified law of Dec. 19, 1917 and the decree of April 1, 1964, the law of March 10, 1948, the law of Aug. 2, 1961, and the law of Dec. 16, 1964 form the legislative basis for pollution control in France. All industry is divided into three categories according to environmental impact, and regulations of varying stringency are applied according to individual categories. The new industrial policy aims not only at forcing new plants to install the latest control equipment, but also at introducing pollution control to existing plants over a period of a dozen years. The introduction of low sulfur fuels and especially of natural gas is one of the basic approaches to atmospheric pollution control. The short-term effects of pollution control on the economy are a relative drop in the consumption of goods and services; long-term effects cannot be assessed other than that the general public will have to foot the bill; but the energetic policy by the government aimed at cleaning up the environment is not incompatible with industrial development.

17898 APTIC NO. 35364

Witherspoon, Robert, John Hoicka, Terry Trumbull, and Don Infeld

GOVERNMENT APPROACHES TO AIR POLLUTION CONTROL. A COMPENDIUM AND ANNOTATED BIBLIOGRAPHY. *Inst. of Public Administration, Washington, D. C., Office of Air Programs Contract EHS 70-126, 432p., July 15, 1971. 375 refs.*

NTIS: PB 203111

An examination is presented of governmental approaches to air pollution control, in order to identify and evaluate alternative federal strategies to improve and develop inducements for control of air pollution by the private sector. Only the problem of controlling stationary source pollution is considered. The study begins with the existing approaches to air pollution control -- present federal legislation, attempts at voluntary compliance, emission standards, and land use controls -- and then moves to newer approaches, notably cost sharing measures, economic incentives, and emission charges, many of which have yet to be tried.

17899 APTIC NO. 35216

Yarosh, M. M.

CHANGING EMPHASIS IN THE SITING OF STEAM ELECTRIC POWER PLANTS. *Preprint, American Society of Mechanical Engineers, New York, 8p., 1970. 28 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, New York, N. Y., Nov. 29-Dec. 3, 1970, Paper 70-WA?Ener-12.)*

Providing enough electrical power to satisfy national demands is being hampered by increasing difficulties in finding adequate power plant sites. As heavy users of land, water, and air, the rapidly growing electric utilities are increasing their impact on the environment, and this increase is reflected in the near crisis in siting. Before the siting pains can be relieved, there must be intelligent long-range planning of research and development on environmentally oriented programs and enlightened cooperative efforts by utilities in establishing guidelines and standards for siting. (Author abstract)

SOCIAL ASPECTS

17900 APTIC NO. 35206

Barltrop, Donald and N. J. P. Killala

FACTORS INFLUENCING EXPOSURE OF CHILDREN TO LEAD. *Arch. Disease Childhood (London), vol. 44:476-479, 1969. 10 refs.*

Paint samples from 56 homes of 103 children aged one to 14 years were obtained. The lead content of the samples was related to the age of the building and to the social class of the family: 53% of the samples contained more than one percent of lead. Old houses, and families of low social class, were frequently associated with indoor paints of high lead content. Lead paint applied several decades ago, if infrequently covered by other paint, may continue to provide a potential hazard. Detection and removal of lead paint in situ should, therefore, be the aim in preventing lead poisoning of children from this source. (Author summary modified)

17901 APTIC NO. 35248

Mason, Robert G.

SOCIAL EFFECTS OF CHANGES IN AIR QUALITY. *In: Air. Study of the Social and Economic Effects of Changes in Air Quality 1970-71. (Annual Report). Oregon State Univ., Corvallis, Air Resources Center, National Air Pollution Control Administration Contract CPA 70-117, 66p., June 1971. 1 ref.*

A theoretical model concerning the effects of air quality changes on public attitudes and mass-media use patterns was tested by interviewing residents of Eugene and Salem, Oregon, during periods of relatively high visual range (May 1970 and January 1971) and relatively low visual range (September 1970). In each city, 300 adults living in single-family dwellings were selected at random and asked to compare air quality for the periods May-September and September-January. Accuracy of perception was determined by comparing responses with visibility measurements indicating that visual restrictions due to air pollution and natural sources were greatest in September and January, respectively. The accuracy varied with city (location effect) and time of interview (timing effect). Nearly twice as many Salem residents inaccurately perceived differences in air quality for the January interview than Eugene residents; a reversal was found for the September interview. Residents of Eugene, with its history of deteriorated air quality in late summer, had been expected to have consistently more accurate perceptions.

17902 APTIC NO. 35375

Mayo, Louis H.

SOCIAL IMPACT ANALYSIS: 1970. *George Washington Univ., Washington, D. C., Program of Policy Studies in Science and Technology, GWPS-SDP 210, National Aeronautics and Space Administration Grant NGL 09-010-030, 49p., March 1971. 68 refs.*

NTIS: PB 199163

The policy analysis function, whether characterized as the contextual approach to social problem analysis, as policy synthesis, as policy development, or as the systems and cybernetic approach, may be viewed as future-oriented inquiries into social objectives and the means of achieving them. Some of the significant events and actions which have contributed to the development of the evaluative function in the governmental process over the past few years are recorded. Particular attention is given to the concept of technology assessment, i.e., the identification and evaluation of the effects flowing from the introduction of a technological application into the social environment.

GENERAL

17903 APTIC NO. 35608

Allcut, E. A.

AIR SANITATION. *Eng. J. (Montreal), 34(7):664-671, July 1951. 27 refs. (Presented at the Engineering Institute of Canada, Annual General and Professional Meeting, 65th, Montreal, Quebec, May 1951.)*

The nature and prevalence of various forms of atmospheric pollution are examined and their effects on health, vegetation, and combustion efficiency discussed. The Donora episode in October 1948 and the Meuse Valley episode in 1930 are described, these represent extreme cases of poisonous concentration. Allowable limits for sulfur dioxide and particle size established by the Committee on Atmospheric Pollution in

Canada are given. Mechanical separators, chemical separators, electrical precipitation, and sonic precipitators are briefly described. Legislative control of the degree of pollution, and the role of public groups and governments are considered.

17904 APTIC NO. 35867

Schweigart, H. A.

HUMAN ECOLOGICAL ASPECTS OF THE ENVIRONMENT AND ENVIRONMENTAL RESEARCH. *(Humanoekologische Umweltaspekte and Unweltforschung.) Text in German. Protectio Vitae, 16(5):217-220, 1971. 3 refs. (Presented at the United Nations Conference Regarding Man s Environment.)*

Environmental protection includes all measures which are necessary to safeguard a clean and healthy environment for man. Production processes produce waste products which disturb the environmental harmony. For example, carbon monoxide, sulfur dioxide, nitrogen oxides and fly ash are waste products from power generation. Environmental pollution is a problem of world-wide dimensions which must be solved by international cooperation. The International Association for the Study of Civilization s Diseases has set up eight groups of themes with 61 subgroups and more than 500 individual topics. It has passed 80 resolutions and recommendations. Three subgroups with their topics are listed as examples. One of them concerns emissions of automobile exhausts. The subgroup comprises 16 topics including the study of the toxic components of the exhaust gases, the efficiency of afterburners, the state of the art of electrically operated vehicles, and special protective measures.

17905 APTIC NO. 35273

Sohlman, Michael

OUR POLLUTED AIR. *(Var fororenade luft). Text in Swedish. Forsk. Framsteg (Stockholm), no. 2:32-33, 1969.*

Reports given at a meeting held on February 17, 1969 by the Swedish Environment Protection Board to discuss problems of air pollution included a description of a 10-year program of immission measurements. Air pollution measurement techniques have developed rapidly in Sweden in recent years, air pollution measurement techniques have developed rapidly in Sweden in recent years, and air quality standards have been established on the basis of normal SO2 values. The results of the program show an absence of air pollution problems during summer, in winter, however, the readings exceeded air quality standards 50% of all cases. Since there are no standards for soot in Sweden, these values are given in micrograms/cu m of air. Another report gave a detailed account of air pollution control in Sweden. The importance of reducing the sulfur content of fuels, and related ecomonic and financial aspects were discussed. Communities should solve their heating problems by choosing sources of energy most favorable to air pollution control.

SUBJECT INDEX

A

ABATEMENT
17058, 17081, 17107, 17149, 17235, 17350, 17380, 17564, 17585, 17632, 17833, 17843, 17847, 17848, 17849, 17852, 17856, 17859, 17861, 17862, 17864, 17866, 17867, 17869, 17870, 17874, 17876, 17877, 17881, 17882, 17884, 17886, 17887, 17889, 17890, 17893, 17894, 17897, 17898, 17899, 17903, 17905

ABSORPTION
17137, 17171, 17185, 17186, 17187, 17188, 17196, 17247, 17255, 17266, 17267, 17284, 17318, 17319, 17324, 17331, 17341, 17366, 17396, 17413, 17432, 17436, 17454, 17467, 17519, 17649, 17691, 17698, 17796, 17801, 17812

ABSORPTION (GENERAL)
17102, 17161, 17163, 17167, 17181, 17199, 17207, 17277, 17283, 17314, 17325, 17329, 17348, 17360, 17369, 17388, 17410, 17667, 17725, 17836

ACID SMUTS
17142, 17254, 17819

ACROLEIN
17710

ACUTE
17126, 17142, 17701, 17709, 17711, 17720, 17721, 17781, 17785, 17794, 17803

ADAPTATION
17763

ADSORPTION
17113, 17124, 17182, 17183, 17270, 17300, 17307, 17356, 17358, 17375, 17384, 17393, 17454, 17528, 17675

ADSORPTION (GENERAL)
17102, 17156, 17159, 17270, 17277, 17312, 17314, 17348, 17352, 17361, 17363, 17369, 17377, 17381

ADVECTION
17621

ADVISORY SERVICES
17042, 17046, 17535, 17776, 17850, 17859, 17894

AERODYNAMICS
17430, 17439, 17584, 17660, 17664

AEROSOL GENERATORS
17306, 17435, 17444, 17692, 17696

AEROSOLS
17083, 17222, 17302, 17325, 17386, 17438, 17446, 17457, 17466, 17505, 17517, 17533, 17541, 17549, 17554, 17565, 17567, 17572, 17574, 17594, 17597, 17606, 17618, 17626, 17629, 17638, 17674, 17675, 17681, 17686, 17687, 17689, 17692, 17736, 17747, 17761, 17764, 17844

AFRICA
17567, 17608

AFTERBURNERS
17045, 17073, 17124, 17125, 17141, 17146, 17152, 17169, 17178, 17193, 17198, 17204, 17235, 17245, 17246, 17248, 17252, 17255, 17263, 17283, 17292, 17311, 17326, 17328, 17343, 17362, 17388, 17406, 17407, 17413, 17831

AIR CONDITIONING EQUIPMENT
17256, 17257, 17258, 17270, 17299, 17370, 17391, 17393, 17409, 17823, 17863

AIR POLLUTION EPISODES
17157, 17582, 17585, 17587, 17605, 17613, 17632, 17634, 17644, 17713, 17727, 17776, 17857, 17878, 17882, 17887, 17894, 17903

AIR POLLUTION FORECASTING
17258, 17280, 17380, 17533, 17575, 17582, 17585, 17594, 17601, 17602, 17604, 17608, 17613, 17614, 17644, 17648, 17657, 17663, 17865, 17878, 17888

AIR QUALITY CRITERIA
17043, 17149, 17582, 17763, 17846, 17891, 17893

AIR QUALITY MEASUREMENT PROGRAMS
17046, 17055, 17380, 17452, 17527, 17535, 17539, 17542, 17550, 17556, 17557, 17559, 17572, 17573, 17585, 17641, 17642, 17734, 17735, 17738, 17782, 17850, 17859, 17860, 17862, 17865, 17871, 17878, 17882, 17885, 17893, 17894, 17901

AIR QUALITY STANDARDS
17036, 17046, 17083, 17109, 17126, 17142, 17166, 17193, 17280, 17408, 17461, 17479, 17526, 17546, 17560, 17568, 17572, 17586, 17590, 17650, 17700, 17702, 17775, 17828, 17835, 17837, 17844, 17845, 17846, 17851, 17858, 17863, 17870, 17878, 17879, 17881, 17893, 17896, 17903, 17905

AIR RESOURCE MANAGEMENT
17062, 17584, 17585, 17590, 17601, 17616, 17632, 17833, 17851, 17852, 17859, 17864, 17866, 17872, 17881, 17884, 17888, 17891, 17894, 17897, 17898, 17899, 17902

AIR-FUEL RATIO
17036, 17039, 17064, 17065, 17068, 17089, 17114, 17118, 17125, 17132, 17134, 17148, 17152, 17178, 17198, 17204, 17235, 17251, 17252, 17259, 17263, 17276, 17313, 17316, 17317, 17326, 17328, 17337, 17364, 17387, 17398, 17403, 17451

AIRCRAFT
17028, 17037, 17043, 17087, 17152, 17415, 17434, 17537, 17538, 17569, 17580, 17596, 17614, 17856

AIRPORTS
17028, 17043, 17569, 17580

AITKEN COUNTERS
17427, 17428, 17429, 17578

ALCOHOLS
17039, 17070, 17086, 17119, 17272, 17342, 17343, 17378, 17610, 17720

ALDEHYDES
17068, 17070, 17073, 17083, 17086, 17103, 17128, 17131, 17142, 17384, 17408, 17491, 17568, 17572, 17610, 17650, 17710, 17782, 17854

ALERTS
17157, 17582, 17585, 17857, 17878, 17894

ALFALFA
17069

ALIPHATIC FRACTIONS
17450

ALKALINE ADDITIVES
17060, 17102, 17165, 17177, 17181, 17199, 17219, 17233, 17234, 17277, 17279, 17283, 17286, 17298, 17309, 17324, 17329, 17336, 17344, 17345, 17348, 17352, 17355, 17363, 17366, 17369, 17410, 17413

ALKALIZED ALUMINA (ADSORPTION)
17102, 17224, 17291, 17305, 17314, 17357, 17363

ALLERGIES
17126, 17733, 17748

ALPHA PARTICLES
17465, 17469, 17470

ALUMINUM
17030, 17040, 17066, 17115, 17221, 17413

ALUMINUM COMPOUNDS
17030, 17183, 17272, 17292, 17294, 17300, 17301, 17304, 17363, 17413, 17508, 17560, 17764

ALUMINUM OXIDES
17129, 17294, 17390, 17413, 17485, 17529, 17551

ALVEOLI
17730, 17736, 17761, 17764

AMIDES
17083

AMINES
17201, 17342, 17436, 17491, 17500, 17667, 17720

AMINO ACIDS
17047, 17709, 17721, 17724, 17750

AMMONIA
17058, 17069, 17083, 17102, 17131, 17142, 17181, 17197, 17198, 17201, 17279, 17329, 17336, 17355, 17363, 17369, 17436, 17454, 17475, 17491, 17500, 17636, 17665, 17693, 17787, 17813, 17818, 17846

AMMONIUM CHLORIDE
17142

AMMONIUM COMPOUNDS
17058, 17069, 17083, 17102, 17131, 17142, 17181, 17197, 17198, 17201, 17265, 17279, 17281, 17292, 17329, 17336, 17345, 17355, 17363, 17369, 17436, 17454, 17475, 17491, 17500, 17636, 17665, 17693, 17787, 17813, 17818, 17846

ANEMIA
17707, 17756

ANEMOMETERS
17454, 17588, 17589, 17593

ANIMALS
17034, 17035, 17056, 17083, 17131, 17193, 17310, 17522, 17545, 17670, 17673, 17701, 17702, 17704, 17709, 17710, 17712, 17714, 17724, 17725, 17728, 17729, 17730, 17736, 17743, 17744, 17746, 17749, 17758, 17761, 17764, 17765, 17777, 17780, 17784, 17785, 17786, 17791, 17792, 17808, 17811, 17818, 17846, 17879

ANTHRACENES
17039, 17676, 17761

ANTIBODIES
17730

ANTICYCLONES
17613, 17648

ANTIDOTES
17705, 17720, 17732, 17756, 17780, 17786

ANTIGENS
17748

ANTIMONY COMPOUNDS
17700, 17765

AREA EMISSION ALLOCATIONS
17218, 17576, 17833, 17889

AREA SURVEYS
17046, 17535, 17550, 17557, 17559, 17572, 17573, 17641, 17734, 17735, 17894, 17901

AROMATIC FRACTIONS
17450

AROMATIC HYDROCARBONS
17070, 17073, 17078, 17086, 17124, 17126, 17127, 17135, 17155, 17211, 17264, 17343, 17362, 17371, 17378, 17450, 17464, 17480, 17558, 17711

ARSENIC COMPOUNDS
17432, 17491, 17560, 17572, 17700, 17808

ARSINE
17491

ASBESTOS
17479, 17705, 17722, 17724, 17840

ASBESTOSIS
17705, 17722, 17779

ASHES
17037, 17107, 17129, 17202, 17268, 17283, 17351, 17448

ASIA
17046, 17101, 17102, 17106, 17114, 17134, 17142, 17143, 17154, 17167, 17169, 17171, 17177, 17179, 17181, 17186, 17187, 17188, 17251, 17255, 17256, 17257, 17266, 17267, 17269, 17270, 17271, 17272, 17273, 17274, 17277, 17282, 17283, 17284, 17293, 17294, 17300, 17301, 17312, 17314, 17316, 17317, 17318, 17319, 17324, 17325, 17329, 17334, 17336, 17348, 17351, 17353, 17354, 17361, 17363, 17377, 17379, 17380, 17381, 17387, 17388, 17389, 17390, 17391, 17406, 17407, 17410, 17416, 17434, 17467, 17475, 17476, 17486, 17521, 17527, 17533, 17534, 17535, 17539, 17550, 17551, 17552, 17557, 17560, 17561, 17564, 17569, 17573, 17629, 17636, 17646, 17648, 17657, 17662, 17663, 17667, 17699, 17701, 17733, 17734, 17744, 17747, 17748, 17753, 17759, 17760, 17774, 17780, 17781, 17784, 17801, 17805, 17823, 17824, 17827, 17835, 17846, 17847, 17849, 17850, 17854, 17855, 17865, 17874, 17876, 17877, 17879, 17886, 17894

ASPHALT
17080, 17146

ASPIRATORS
17057, 17437, 17514, 17523

ASTHMA
17713, 17723, 17733, 17734, 17748, 17753, 17759, 17760, 17762, 17774

ATLANTA
17566

ATMOSPHERIC MOVEMENTS
17069, 17109, 17112, 17116, 17136, 17140, 17202, 17402, 17416, 17438, 17535, 17540, 17543, 17549, 17550, 17553, 17564, 17567, 17578, 17580, 17583, 17585, 17586, 17589, 17590, 17593, 17594, 17595, 17596, 17598, 17599, 17601, 17604, 17608, 17609, 17610, 17613, 17614, 17621, 17622, 17623, 17624, 17627, 17635, 17636, 17638, 17639, 17644, 17645, 17646, 17648, 17652, 17656, 17659, 17660, 17661, 17663, 17664, 17666, 17812, 17834, 17865, 17876, 17883

ATMOSPHERIC PHENOMENA
17034, 17035, 17037, 17042, 17046, 17058, 17069, 17072, 17078, 17083, 17084, 17091, 17095, 17097, 17102, 17104, 17108, 17109, 17110, 17111, 17112, 17116, 17121, 17136, 17140, 17146, 17148, 17149, 17163, 17191, 17202, 17208, 17258, 17260, 17264, 17265, 17270, 17279, 17280, 17305, 17312, 17359, 17360, 17380, 17393, 17402, 17410, 17416, 17420, 17438, 17441, 17452, 17454, 17458, 17486, 17497, 17505, 17517, 17533, 17534, 17535, 17538, 17540, 17543, 17543, 17545, 17547, 17549, 17550, 17551, 17553, 17561, 17562, 17564, 17565, 17567, 17569, 17571, 17572, 17574, 17575, 17576, 17577, 17578, 17579, 17580, 17581, 17582, 17583, 17583, 17584, 17585, 17586, 17587, 17588, 17588, 17589, 17589, 17590, 17591, 17591, 17593, 17594, 17594, 17595, 17596, 17597, 17598, 17599, 17600, 17601, 17602, 17603, 17604, 17604, 17605, 17606, 17607, 17608, 17609, 17610, 17612, 17613, 17614, 17614, 17615, 17616, 17618, 17619, 17620, 17621, 17622, 17623, 17624, 17625, 17625, 17626, 17627, 17628, 17629, 17630, 17632, 17633, 17634, 17635, 17636, 17637, 17638, 17639, 17639, 17640, 17641, 17642, 17643, 17644, 17644, 17645, 17646, 17647, 17648, 17649, 17650, 17652, 17653, 17656, 17656, 17657, 17658, 17659, 17660, 17660, 17661, 17662, 17663, 17663, 17664, 17664, 17666, 17673, 17674, 17675, 17681, 17681, 17682, 17683, 17689, 17692, 17695, 17727, 17728, 17762, 17793, 17812, 17817, 17818, 17819, 17821, 17823, 17825, 17827, 17834, 17854, 17854, 17857, 17865, 17871, 17872, 17876, 17878, 17879, 17881, 17882, 17883, 17885, 17887, 17888, 17891

AUSTRALIA
17050, 17208, 17230, 17313, 17322, 17375, 17383, 17456, 17491, 17615, 17627, 17732, 17825, 17831

AUTOMATIC METHODS
17029, 17055, 17380, 17416, 17433, 17475, 17477, 17479, 17481, 17511, 17527, 17860

AUTOMOBILES
17031, 17037, 17039, 17047, 17051, 17055, 17059, 17064, 17073, 17075, 17076, 17078, 17083, 17086, 17090, 17109, 17110, 17118, 17119, 17125, 17127, 17139, 17140, 17151, 17152, 17158, 17197, 17204, 17237, 17251, 17254, 17263, 17316, 17321, 17328, 17350, 17378, 17452, 17536, 17537, 17564, 17650, 17662, 17713, 17740, 17837, 17841, 17848, 17850, 17855, 17856, 17889, 17893, 17904

AUTOMOTIVE EMISSION CONTROL
17033, 17036, 17039, 17044, 17045, 17051, 17057, 17059, 17064, 17065, 17068, 17070, 17073, 17076, 17085, 17086, 17089, 17090, 17098, 17114, 17118, 17119, 17124, 17125, 17132, 17134, 17141, 17147, 17148, 17152, 17158, 17166, 17169, 17178, 17197, 17198, 17204, 17235, 17237, 17242, 17245, 17246, 17251, 17252, 17254, 17259, 17263, 17264, 17276, 17292, 17311, 17313, 17316, 17317, 17321, 17322, 17326, 17328, 17337, 17349, 17353, 17364, 17371, 17379, 17384, 17387, 17389, 17397, 17398, 17403, 17406, 17407, 17408, 17451, 17832, 17837, 17850

AUTOMOTIVE EMISSIONS
17028, 17032, 17039, 17042, 17043, 17044, 17045, 17047, 17051, 17055, 17057, 17059, 17061, 17064, 17068, 17070, 17073, 17075, 17076, 17078, 17085, 17086, 17089, 17098, 17102, 17103, 17109, 17110, 17114, 17118, 17121, 17124, 17125, 17127, 17128, 17132, 17141, 17147, 17151, 17152, 17158, 17166, 17169, 17176, 17178, 17197, 17204, 17237, 17242, 17245, 17246, 17248, 17251, 17252, 17254, 17259, 17263, 17264, 17276, 17311, 17313, 17316, 17317, 17321, 17322, 17326, 17328, 17331, 17340, 17349, 17350, 17353, 17367, 17371, 17378, 17379, 17384, 17387, 17389, 17397, 17398, 17403, 17406, 17407, 17408, 17440, 17451, 17459, 17475, 17476, 17478, 17480, 17498, 17532, 17536, 17551, 17553, 17562, 17564, 17580, 17596, 17606, 17650, 17655, 17740, 17782, 17812, 17818, 17832, 17837, 17841, 17843, 17851, 17854, 17855, 17865, 17872, 17874, 17883, 17887, 17889, 17891, 17904

AUTOPSY
17880

AZINES
17500

AZO DYE
17458

B

BACTERIA
17083, 17117, 17454, 17700, 17799

BAFFLES
17195, 17229, 17261, 17290, 17367, 17394, 17400

BAG FILTERS
17180, 17221, 17236, 17269, 17275, 17280, 17315, 17330, 17404, 17454, 17543

BALLOONS
17454, 17457, 17614

BARIUM COMPOUNDS
17281, 17560

BASIC OXYGEN FURNACES
17236, 17401, 17868

BATTERY MANUFACTURING
17059, 17094, 17171

BELGIUM
17542, 17588, 17589, 17822, 17860

BENZENE-SOLUBLE ORGANIC MATTER
17409, 17415, 17450, 17556

BENZENES
17124, 17211, 17378, 17558, 17711

BENZO(3-4)PYRENE
17074, 17105, 17110, 17464, 17771, 17778

BENZOPYRENES
17039, 17074, 17078, 17105, 17110, 17464, 17654, 17676, 17771, 17777, 17778

BERYLLIOSIS
17765

BERYLLIUM
17066

BERYLLIUM COMPOUNDS
17066, 17153, 17469, 17470, 17479, 17556, 17700, 17764, 17765, 17840

BERYLLIUM OXIDES
17066, 17485

BESSEMER CONVERTERS
17236

BIO-ASSAY
17464

BIOCLIMATOLOGY
17727

BIRDS
17728, 17792

BISMUTH COMPOUNDS
17765

BLACK LIQUOR OXIDATION
17302, 17324

BLAST FURNACES
17212, 17221, 17236, 17295, 17329, 17868

BLENDING
17070

BLOOD CELLS
17142, 17719, 17740, 17743, 17745, 17746, 17767, 17785, 17786

BLOOD CHEMISTRY
17435, 17570, 17572, 17720, 17721, 17737, 17756, 17757, 17760, 17768, 17772, 17791, 17792

BLOOD PRESSURE
17109, 17765

BLOOD VESSELS
17142, 17744

BLOWBY
17125

BODY FLUIDS
17737, 17880

BOILERS
17029, 17037, 17044, 17067, 17077, 17093, 17100, 17108, 17173, 17202, 17223, 17226, 17254, 17283, 17304, 17324, 17325, 17333, 17336, 17361, 17454, 17576, 17598, 17665, 17856

BONES
17792, 17811

BORON COMPOUNDS
17153, 17514, 17700

BREATHING
17714, 17764, 17781

BREATHING APPARATUS
17306, 17773

BRICKS
17819

BROMIDES
17233

BROMINE
17449, 17508, 17677

BROMINE COMPOUNDS
17233, 17553, 17560, 17562

BRONCHI
17126, 17142, 17743

BRONCHIAL CANCER
17771

BRONCHITIS
17142, 17572, 17713, 17723, 17733, 17748, 17753, 17760, 17762, 17766, 17774

BRONCHOCONSTRICTION
17715

BRONCHODILATORS
17715

BROWNIAN MOVEMENT
17208, 17629

BUBBLE TOWERS
17319

BUDGETS
17850

BUILD-UP RATES
17644

BUILDINGS
17032, 17074, 17258, 17409, 17544, 17564, 17566, 17568, 17802, 17814, 17815, 17883

BUSES
17044, 17054, 17057, 17076, 17118, 17321, 17537

BUTANES
17080, 17089, 17313, 17611, 17685

BUTENES
17611, 17649, 17694

BY-PRODUCT RECOVERY
17030, 17040, 17060, 17082, 17117, 17135, 17137, 17159, 17163, 17167, 17168, 17171, 17174, 17177, 17181, 17185, 17190, 17192, 17194, 17201, 17209, 17213, 17218, 17219, 17225, 17227, 17233, 17243, 17244, 17264, 17265, 17266, 17267, 17277, 17283, 17286, 17298, 17312, 17325, 17329, 17337, 17345, 17352, 17361, 17363, 17372, 17381, 17388, 17410, 17412, 17582, 17665, 17679, 17828

C

CADMIUM
17755

CADMIUM COMPOUNDS
17549, 17555, 17560, 17700, 17765, 17781

CALCIUM COMPOUNDS
17040, 17163, 17165, 17167, 17185, 17199, 17209, 17219, 17223, 17283, 17286, 17309, 17345, 17369, 17551, 17559, 17719, 17743, 17786

CALCIUM SULFATES
17163, 17167, 17185, 17199, 17219, 17283, 17309, 17345

CALIBRATION METHODS
17143, 17354, 17421, 17425, 17426, 17431, 17439, 17441, 17443, 17452, 17453, 17482, 17487, 17491, 17494, 17496, 17499, 17501, 17502, 17503, 17515, 17568

CALIFORNIA
17028, 17036, 17044, 17115, 17116, 17157, 17263, 17371, 17524, 17526, 17538, 17551, 17590, 17602, 17738, 17812, 17821, 17846, 17869

CANADA
17038, 17053, 17057, 17058, 17060, 17094, 17095, 17108, 17304, 17352, 17378, 17404, 17462, 17502, 17541, 17587, 17596, 17656, 17659, 17710, 17766, 17779, 17799, 17871, 17875, 17903

CANCER
17105, 17723, 17733, 17742, 17749, 17751, 17755, 17762, 17764, 17765, 17770, 17771, 17808

CANNING
17116

CARBON BLACK
17102, 17146, 17159, 17182, 17183, 17184, 17238, 17270, 17273, 17277, 17307, 17312, 17352, 17356, 17361, 17363, 17369, 17375, 17377, 17393, 17528, 17655, 17693, 17823

CARBON DIOXIDE
17063, 17069, 17083, 17103, 17107, 17108, 17110, 17114, 17130, 17148, 17173, 17193, 17199, 17201, 17235, 17254, 17315, 17325, 17357, 17358, 17365, 17366, 17387, 17391, 17408, 17415, 17419, 17443, 17445, 17467, 17481, 17486, 17518, 17544, 17545, 17547, 17552, 17581, 17597, 17620, 17626, 17649, 17650, 17665, 17685, 17747, 17801, 17819, 17842, 17848, 17891

CARBON DISULFIDE
17083, 17194, 17436, 17520, 17558

CARBON MONOXIDE
17028, 17037, 17039, 17043, 17044, 17045, 17059, 17061, 17064, 17069, 17072, 17073, 17075, 17076, 17077, 17079, 17083, 17087, 17103, 17108, 17109, 17110, 17114, 17118, 17119, 17121, 17125, 17130, 17139, 17148, 17152, 17169, 17178, 17204, 17211, 17218, 17251, 17252, 17254, 17255, 17263, 17311, 17313, 17315, 17321, 17326, 17328, 17357, 17365, 17387, 17391, 17401, 17403, 17408, 17409, 17413, 17415, 17443, 17445, 17454, 17462, 17467, 17475, 17479, 17486, 17490, 17491, 17497, 17526, 17536, 17537, 17538, 17539, 17544, 17550, 17552, 17564, 17572, 17573, 17590, 17602, 17605, 17611, 17648, 17649, 17662, 17685, 17688, 17690, 17701, 17706, 17738, 17780, 17782, 17835, 17837, 17841, 17843, 17857, 17865, 17887, 17893

CARBONATES
17213, 17242, 17665, 17819

CARBONYLS
17194, 17475

CARBOXYHEMOGLOBIN
17109

CARBURETION
17125, 17134, 17178, 17204, 17252, 17313, 17317, 17328, 17397, 17451

CARCINOGENS
17110, 17464, 17525, 17722, 17728, 17749, 17764, 17777, 17782, 17783

CARDIOVASCULAR DISEASES
17713, 17732, 17735, 17762, 17765, 17772, 17776

CASCADE SAMPLERS
17229, 17415, 17430, 17438, 17454, 17466, 17479, 17492, 17517, 17541, 17549, 17550, 17606, 17618, 17686

CATALYSIS
17065, 17073, 17113, 17154, 17159, 17183, 17184, 17190, 17192, 17194, 17197, 17224, 17265, 17272, 17273, 17274, 17293, 17294, 17300, 17301, 17309, 17326, 17334, 17343, 17349, 17354, 17357, 17363, 17365, 17377, 17390, 17412, 17461, 17485, 17592, 17693, 17694, 17854

CATALYSTS
17113, 17159, 17183, 17184, 17190, 17192, 17194, 17197, 17224, 17265, 17272, 17273, 17293, 17294, 17301, 17309, 17326, 17334, 17343, 17349, 17354, 17357, 17363, 17365, 17377, 17390, 17412, 17485, 17693, 17854

CATALYTIC ACTIVITY
17065, 17073, 17113, 17154, 17183, 17184, 17190, 17192, 17197, 17224, 17265, 17272, 17273, 17274, 17293, 17294, 17300, 17301, 17334, 17349, 17377, 17461, 17485, 17693

CATALYTIC AFTERBURNERS
17045, 17073, 17124, 17125, 17198, 17204, 17252, 17263, 17292, 17311, 17326, 17328, 17343, 17831

CATALYTIC OXIDATION
17030, 17077, 17102, 17192, 17197, 17198, 17204, 17207, 17265, 17302, 17324, 17343, 17346, 17349, 17352, 17363, 17369, 17393, 17485, 17854

CATS
17701

CATTLE
17785, 17786, 17808, 17811, 17818

CELL GROWTH
17706, 17750, 17818

CELL METABOLISM
17676, 17745, 17746, 17758

CELLS
17142, 17705, 17706, 17719, 17740, 17743, 17744, 17745, 17746, 17747, 17754, 17761, 17767, 17777, 17785, 17786, 17798, 17799

CEMENTS
17146, 17193, 17333, 17368, 17404, 17546, 17679, 17819, 17842, 17889

CENTRIFUGAL SEPARATORS
17077, 17136, 17146, 17163, 17172, 17178, 17179, 17195, 17203, 17206, 17211, 17229, 17235, 17236, 17238, 17269, 17308, 17315, 17325, 17351, 17399, 17438, 17439, 17451, 17454, 17513, 17543, 17831

CERAMICS
17110, 17198, 17741, 17874

CHARCOAL
17258, 17361, 17381, 17391, 17393, 17503, 17562

CHEMICAL BONDS
17309, 17445, 17461, 17671, 17680, 17693, 17705

CHEMICAL COMPOSITION
17068, 17083, 17103, 17104, 17121, 17128, 17135, 17409, 17415, 17442, 17445, 17446, 17450, 17466, 17492, 17508, 17541, 17549, 17550, 17551, 17552, 17553, 17554, 17556, 17559, 17560, 17563, 17565, 17572, 17593, 17699, 17765, 17812

CHEMICAL METHODS
17235, 17298, 17412, 17415, 17422, 17432, 17436, 17437, 17442, 17443, 17449, 17452, 17454, 17461, 17466, 17475, 17482, 17491, 17504, 17515, 17524, 17526, 17527, 17549, 17558, 17697, 17824, 17860

CHEMICAL PROCESSING
17058, 17060, 17062, 17063, 17075, 17105, 17123, 17130, 17135, 17146, 17147, 17149, 17192, 17198, 17213, 17218, 17243, 17244, 17249, 17264, 17302, 17303, 17307, 17314, 17320, 17324, 17325, 17333, 17340, 17366, 17374, 17388, 17389, 17394, 17410, 17446, 17453, 17454, 17473, 17502, 17537, 17541, 17557, 17558, 17570, 17573, 17650, 17665, 17711, 17781, 17800, 17813, 17830, 17836, 17839, 17842, 17855, 17856

CHICAGO
17460, 17566, 17821

CHLORATES
17366

CHLORIDES
17104, 17183, 17184, 17189, 17223, 17266, 17267, 17348, 17491, 17500, 17746, 17764, 17824

CHLORINATED HYDROCARBONS
17101, 17491, 17570, 17728

CHLORINE
17267, 17366, 17449, 17475, 17508, 17510, 17787, 17801

CHLORINE COMPOUNDS
17035, 17060, 17083, 17097, 17104, 17142, 17183, 17184, 17189, 17223, 17266, 17267, 17348, 17366, 17454, 17475, 17491, 17500, 17551, 17559, 17560, 17746, 17764, 17787, 17824, 17846

CHLOROPLASTS
17808

CHLOROSIS
17803, 17806, 17814, 17815

CHROMATOGRAPHY
17123, 17149, 17235, 17353, 17415, 17416, 17436, 17445, 17450, 17453, 17454, 17460, 17462, 17473, 17478, 17479, 17480, 17493, 17494, 17504, 17510, 17515, 17520, 17521, 17524, 17526, 17531, 17558, 17570, 17721, 17728, 17752, 17777, 17877

CHROMIUM COMPOUNDS
17182, 17183, 17213, 17292, 17551, 17559, 17560, 17572

CHROMIUM OXIDES
17184, 17491, 17693

CILIA
17747

CINCINNATI
17821, 17881

CINDERS
17315, 17351

CIRCULATORY SYSTEM
17142, 17670, 17710, 17729, 17732, 17744, 17786

CITIZENS GROUPS
17852

CITRUS
17806, 17807

CITY GOVERNMENTS
17564

CLAY
17146

CLEAN AIR ACT
17252, 17350, 17841, 17842, 17858

CLOUDS
17109, 17110, 17517, 17533, 17575, 17577, 17579, 17596, 17601, 17618, 17622, 17626, 17645, 17646, 17652, 17661, 17675

CLOVER
17793

COAL
17026, 17037, 17053, 17059, 17075, 17088, 17102, 17108, 17112, 17129, 17138, 17140, 17144, 17146, 17153, 17191, 17211, 17223, 17234, 17236, 17279, 17283, 17323, 17333, 17340, 17361, 17411, 17522, 17536, 17537, 17551, 17564, 17607, 17650, 17659, 17726, 17740, 17761, 17864, 17871, 17889

COAL CHARACTERISTICS
17108, 17129, 17153, 17323

COAL PREPARATION
17213, 17230, 17279, 17284, 17323

COAL RESOURCES
17088, 17112, 17129, 17138, 17140, 17153, 17323, 17864

COBALT COMPOUNDS
17159, 17194, 17222, 17294, 17300, 17354, 17390, 17560, 17699, 17745, 17767

CODES
17848

COKE
17113, 17211, 17236, 17244, 17289, 17315, 17329, 17363, 17520, 17558, 17839, 17868

COLLECTORS
17077, 17107, 17136, 17146, 17163, 17172, 17178, 17179, 17191, 17193, 17195, 17203, 17206, 17211, 17227, 17229, 17235, 17236, 17238, 17253, 17256, 17257, 17261, 17269, 17278, 17280, 17282, 17290, 17302, 17308, 17315, 17325, 17339, 17351, 17367, 17382, 17383, 17394, 17399, 17400, 17438, 17439, 17451, 17454, 17513, 17543, 17679, 17689, 17831, 17835, 17903

COLLOIDS
17673, 17686

COLORADO
17644

COLORIMETRY
17128, 17235, 17415, 17424, 17453, 17454, 17479, 17487, 17491, 17500, 17504, 17514, 17519, 17524, 17544, 17554, 17568, 17636, 17878

COLUMN CHROMATOGRAPHY
17570

COMBUSTION
17042, 17050, 17064, 17065, 17096, 17098, 17101, 17104, 17114, 17129, 17145, 17150, 17251, 17271, 17276, 17332, 17362, 17364, 17431, 17496, 17683, 17691, 17889

COMBUSTION AIR
17065, 17108, 17129, 17134, 17141, 17145, 17150, 17163, 17234, 17245, 17246, 17248, 17250, 17252, 17254, 17304, 17317, 17322, 17324, 17332, 17337, 17362, 17364, 17403, 17842

COMBUSTION GASES
17026, 17032, 17036, 17046, 17048, 17052, 17053, 17055, 17058, 17065, 17080, 17082, 17084, 17091, 17093, 17101, 17107, 17108, 17120, 17129, 17130, 17144, 17145, 17146, 17156, 17159, 17161, 17162, 17163, 17164, 17165, 17167, 17168, 17170, 17172, 17174, 17177, 17179, 17180, 17181, 17185, 17186, 17187, 17188, 17189, 17191, 17194, 17198, 17199, 17202, 17206, 17212, 17213, 17218, 17219, 17224, 17229, 17233, 17243, 17244, 17249, 17250, 17254, 17255, 17265, 17268, 17271, 17277, 17282, 17283, 17286, 17290, 17295, 17296, 17298, 17303, 17304, 17305, 17309, 17312, 17314, 17315, 17324, 17325, 17329, 17332, 17335, 17336, 17337, 17340, 17344, 17345, 17346, 17347, 17351, 17352, 17355, 17357, 17361, 17363, 17364, 17368, 17369, 17372, 17374, 17388, 17393, 17394, 17396, 17399, 17402, 17410, 17416, 17454, 17475, 17486, 17496, 17502, 17518, 17523, 17534, 17535, 17541, 17546, 17569, 17575, 17576, 17586, 17598, 17607, 17627, 17629, 17636, 17657, 17661, 17663, 17780, 17797, 17805, 17828, 17831, 17832, 17842, 17850, 17851, 17854, 17863, 17867, 17868, 17871, 17879

COMBUSTION PRODUCTS
17026, 17032, 17036, 17037, 17046, 17048, 17052, 17053, 17055, 17058, 17065, 17080, 17082, 17084, 17091, 17093, 17101, 17104, 17106, 17107, 17108, 17120, 17129, 17130, 17138, 17144, 17145, 17146, 17150, 17156, 17159, 17161, 17162, 17163, 17164, 17165, 17167, 17168, 17170, 17172, 17174, 17177, 17179, 17180, 17181, 17185, 17186, 17187, 17188, 17189, 17191, 17194, 17198, 17199, 17202, 17206, 17212, 17213, 17218, 17219, 17224, 17229, 17233, 17243, 17244, 17249, 17250, 17254, 17255, 17265, 17268, 17271, 17277, 17282, 17283, 17286, 17290, 17295,

17296, 17298, 17303, 17304, 17305, 17309, 17312, 17314, 17315, 17324, 17325, 17329, 17332, 17335, 17336, 17337, 17340, 17344, 17345, 17346, 17347, 17351, 17352, 17355, 17357, 17361, 17363, 17364, 17368, 17369, 17372, 17374, 17388, 17393, 17394, 17396, 17399, 17402, 17410, 17416, 17448, 17454, 17475, 17486, 17496, 17502, 17518, 17523, 17534, 17535, 17541, 17546, 17551, 17569, 17575, 17576, 17586, 17598, 17607, 17627, 17629, 17636, 17650, 17657, 17661, 17663, 17675, 17683, 17686, 17780, 17797, 17805, 17819, 17828, 17831, 17832, 17834, 17836, 17842, 17847, 17850, 17851, 17854, 17863, 17867, 17868, 17871, 17879

COMMERCIAL EQUIPMENT
17479

COMMERCIAL FIRMS
17291, 17311, 17849

COMPLAINTS
17535, 17855

COMPOSTING
17117

COMPRESSION
17665

COMPUTER PROGRAMS
17037, 17280, 17420, 17529, 17585, 17586, 17608, 17829, 17881

COMPUTERS
17447, 17542, 17585, 17588, 17589, 17609, 17683, 17854, 17894

CONCRETE
17819

CONDENSATION
17072, 17091, 17244, 17318, 17375, 17386, 17429, 17454, 17459, 17545, 17577, 17580, 17618, 17646

CONDENSATION (ATMOSPHERIC)
17042, 17109, 17110, 17111, 17264, 17486, 17517, 17533, 17540, 17574, 17575, 17577, 17578, 17579, 17580, 17587, 17594, 17596, 17599, 17601, 17612, 17616, 17618, 17622, 17626, 17634, 17638, 17645, 17646, 17652, 17661, 17675, 17762, 17827, 17857, 17891

CONNECTICUT
17189, 17409

CONSTRUCTION MATERIALS
17080, 17095, 17100, 17146, 17178, 17189, 17193, 17228, 17278, 17321, 17333, 17368, 17376, 17385, 17404, 17546, 17679, 17819, 17842, 17889

CONTACT PROCESSING
17192, 17243, 17314, 17388, 17410

CONTINUOUS MONITORING
17089, 17123, 17267, 17416, 17433, 17443, 17451, 17453, 17454, 17455, 17462, 17467, 17475, 17477, 17478, 17479, 17485, 17499, 17504, 17506, 17516, 17518, 17527, 17535, 17550, 17571, 17585, 17586, 17635, 17714, 17730, 17845, 17860, 17865

CONTROL AGENCIES
17157, 17380, 17420, 17535, 17836, 17845, 17848, 17849, 17850, 17852, 17854, 17862, 17867, 17870, 17877, 17879, 17882, 17894, 17897, 17905

CONTROL PROGRAMS
17046, 17059, 17081, 17157, 17173, 17206, 17236, 17279, 17315, 17340, 17350, 17380, 17535, 17537, 17658, 17713, 17766, 17833, 17839, 17847, 17848, 17849, 17850, 17853, 17859, 17861, 17862, 17864, 17865, 17867, 17871, 17872, 17874, 17876, 17879, 17881, 17882, 17884, 17885, 17886, 17888, 17892, 17893, 17894, 17899

CONTROLLED ATMOSPHERES
17028, 17358, 17393, 17474

CONVECTION (ATMOSPHERIC)
17610, 17623, 17646, 17666

COOLING
17036, 17144, 17150, 17159, 17172, 17178, 17202, 17207, 17244, 17251, 17290, 17368, 17454, 17575, 17652, 17665, 17820

COPPER
17036, 17066, 17115, 17190, 17219, 17266, 17337, 17755, 17828

COPPER ALLOYS
17036, 17066, 17115

COPPER COMPOUNDS
17082, 17182, 17183, 17184, 17197, 17266, 17292, 17301, 17326, 17349, 17365, 17369, 17549, 17559, 17672, 17699

CORONA
17241, 17471, 17667, 17682

CORROSION
17108, 17146, 17189, 17202, 17223, 17226, 17237, 17295, 17304, 17375, 17523, 17820, 17821, 17822, 17823, 17827

COSTS
17030, 17034, 17060, 17066, 17071, 17077, 17106, 17107, 17112, 17116, 17119, 17122, 17137, 17138, 17146, 17149, 17151, 17154, 17155, 17158, 17165, 17167, 17168, 17172, 17176, 17181, 17193, 17200, 17206, 17221, 17224, 17227, 17235, 17236, 17238, 17270, 17275, 17279, 17280, 17299, 17302, 17303, 17311, 17315, 17323, 17331, 17333, 17336, 17337, 17340, 17352, 17356, 17363, 17369, 17374, 17375, 17380, 17382, 17384, 17404, 17453, 17457, 17459, 17479, 17487, 17585, 17774, 17826, 17828, 17830, 17831, 17832, 17833, 17834, 17836, 17837, 17848, 17849, 17850, 17852, 17862, 17866, 17867, 17868, 17877, 17881, 17886, 17888, 17894, 17895

COTTON
17069, 17789

COTTONS
17287, 17338

COUGH
17699, 17733, 17781

CRANKCASE EMISSIONS
17064, 17125, 17204, 17252, 17263

CRANKCASE VENTILATION AIR
17064

CRITERIA
17029, 17034, 17035, 17043, 17059, 17076, 17084, 17149, 17193, 17204, 17221, 17229, 17231, 17236, 17267, 17279, 17287, 17296, 17306, 17311, 17315, 17340, 17417, 17422, 17425, 17438, 17444, 17479, 17524, 17531, 17582, 17763, 17835, 17838, 17842, 17846, 17889, 17890, 17891, 17893, 17895

CROP SPRAYING
17069, 17099, 17434, 17570, 17571

CROPS
17049, 17052, 17069, 17193, 17214, 17443, 17582, 17658, 17678, 17789, 17793, 17798, 17808, 17812, 17815, 17829, 17834

CRYSTAL STRUCTURE
17272, 17373, 17456

CUMULATIVE METHODS
17426, 17527, 17535, 17548, 17557, 17699

CUPOLAS
17077, 17079, 17172, 17227, 17236, 17315, 17863

CYANIDES
17255, 17449, 17500

CYCLONES (ATMOSPHERIC)
17621, 17648

CZECHOSLOVAKIA
17074, 17093, 17113, 17494, 17750

D

DATA ANALYSIS
17037, 17420, 17517, 17560, 17588, 17829, 17830, 17833, 17894

DATA HANDLING SYSTEMS
17037, 17280, 17420, 17510, 17517, 17529, 17537, 17545, 17560, 17585, 17586, 17588, 17608, 17635, 17829, 17830, 17833, 17860, 17878, 17881, 17894

DECISIONS
17869

DECOMPOSITION
17255, 17309, 17592, 17693, 17818

DELAWARE
17776, 17858

DENSITY
17146, 17190, 17269, 17386, 17441, 17442, 17446, 17466, 17579, 17622, 17667, 17674, 17675, 17682

DEPOSITION
17182, 17184, 17237, 17273, 17360, 17430, 17439, 17454, 17607, 17610, 17633, 17642, 17659, 17666, 17687, 17692, 17747, 17755, 17792, 17812, 17824

DESULFURIZATION OF FUELS
17070, 17102, 17106, 17107, 17154, 17200, 17202, 17213, 17230, 17272, 17273, 17274, 17279, 17280, 17284, 17291, 17293, 17294, 17300, 17301, 17323, 17334, 17340, 17354, 17390, 17539, 17582, 17850, 17897

DETROIT
17549, 17821

DIAGNOSIS
17464, 17699, 17710, 17712, 17713, 17717, 17718, 17721, 17732, 17733, 17734, 17737, 17750, 17753, 17756, 17757, 17773, 17778, 17781, 17785, 17791, 17880

DIESEL ENGINES
17037, 17057, 17068, 17089, 17098, 17103, 17128, 17148, 17176, 17281, 17328, 17384, 17440, 17532, 17536, 17537, 17854

DIFFRACTION
17182, 17456, 17492, 17824

DIFFUSION
17042, 17046, 17058, 17095, 17116, 17163, 17202, 17208, 17305, 17441, 17547, 17564, 17569, 17575, 17576, 17583, 17584, 17585, 17586, 17588, 17589, 17590, 17591, 17595, 17597, 17598, 17602, 17604, 17606, 17607, 17608, 17609, 17610, 17614, 17615, 17625, 17627, 17629, 17630, 17632, 17636, 17639, 17642, 17644, 17656, 17657, 17659, 17660, 17663, 17664, 17674, 17683, 17689, 17692, 17695, 17871, 17872, 17881, 17885, 17888

DIFFUSION MODELS
17046, 17058, 17202, 17569, 17575, 17576, 17583, 17585, 17586, 17589, 17590, 17591, 17595, 17598, 17602, 17604, 17606, 17608, 17609, 17614, 17615, 17627, 17629, 17632, 17639, 17644, 17656, 17657, 17659, 17660,

17663, 17664, 17674, 17689, 17692, 17872, 17881, 17888

DIGESTERS
17201

DIGESTIVE SYSTEM
17142, 17709, 17714, 17718, 17728, 17750, 17765, 17772, 17777, 17783, 17785, 17786, 17791, 17792

DIPHENYLS
17711

DISPERSIONS
17373, 17673, 17686

DISSIPATION RATES
17099, 17534, 17571, 17642, 17644

DISSOCIATION
17225, 17355, 17447, 17615, 17777

DISTILLATE OILS
17026, 17274, 17537, 17889

DOGS
17670, 17712, 17786

DOMESTIC HEATING
17029, 17037, 17055, 17059, 17075, 17083, 17106, 17111, 17130, 17140, 17146, 17173, 17298, 17332, 17336, 17340, 17539, 17650, 17726, 17859, 17887, 17889

DROPLETS
17165, 17196, 17228, 17253, 17260, 17261, 17325, 17388, 17400, 17454, 17579, 17622, 17652, 17682

DRUGS
17705, 17715, 17720, 17732, 17756, 17757, 17759, 17780, 17783, 17786

DRYING
17080, 17177, 17310, 17362, 17381, 17546

DUMPS
17037, 17116, 17139

DUST FALL
17084, 17123, 17543, 17548, 17556, 17557, 17559, 17566, 17605, 17633, 17659, 17699

DUSTS
17038, 17046, 17069, 17075, 17077, 17080, 17081, 17083, 17109, 17110, 17113, 17123, 17136, 17162, 17164, 17172, 17180, 17186, 17187, 17188, 17191, 17193, 17195, 17211, 17216, 17221, 17223, 17227, 17231, 17236, 17256, 17260, 17266, 17269, 17275, 17278, 17279, 17280, 17283, 17287, 17295, 17297, 17299, 17315, 17318, 17319, 17324, 17325, 17330, 17333, 17338, 17351, 17359, 17361, 17368, 17373, 17382, 17383, 17385, 17392, 17400, 17404, 17411, 17413, 17421, 17427, 17428, 17429, 17439, 17450, 17455, 17464, 17469, 17482, 17483, 17495, 17499, 17500, 17501, 17523, 17535, 17540, 17546, 17555, 17560, 17561, 17567, 17572, 17576, 17577, 17578, 17579, 17593, 17594, 17626, 17633, 17638, 17643, 17648, 17650, 17659, 17666, 17689, 17715, 17724, 17741, 17743, 17764, 17778, 17779, 17781, 17785, 17787, 17801, 17809, 17824, 17825, 17826, 17835, 17854, 17856, 17863, 17865, 17868, 17893, 17895

DYNAMOMETERS
17033, 17064, 17127, 17478, 17506

E

ECONOMIC LOSSES
17034, 17582, 17829, 17832, 17834, 17848, 17891, 17897

EDUCATION
17158, 17340, 17476, 17751, 17850, 17880

ELECTRIC FURNACES
17077, 17079, 17160, 17227, 17236, 17282, 17868

ELECTRIC POWER PRODUCTION
17026, 17037, 17053, 17055, 17059, 17071, 17075, 17088, 17092, 17102, 17106, 17112, 17130, 17137, 17138, 17140, 17144, 17146, 17191, 17199, 17202, 17206, 17220, 17224, 17234, 17277, 17279, 17280, 17286, 17323, 17333, 17345, 17352, 17361, 17369, 17502, 17537, 17551, 17575, 17586, 17590, 17607, 17627, 17650, 17652, 17661, 17662, 17723, 17825, 17842, 17847, 17850, 17856, 17861, 17864, 17866, 17871, 17889, 17892, 17899, 17904

ELECTRIC PROPULSION
17033, 17054, 17057, 17059, 17085, 17088, 17090, 17119, 17122, 17133, 17140, 17158, 17166, 17234, 17772, 17850, 17854, 17904

ELECTRICAL MEASUREMENT DEVICES
17449

ELECTRICAL PROPERTIES
17085, 17113, 17133, 17146, 17217, 17221, 17222, 17241, 17278, 17289, 17297, 17304, 17333, 17339, 17346, 17347, 17367, 17376, 17391, 17395, 17411, 17435, 17449, 17451, 17456, 17457, 17468, 17471, 17474, 17667, 17681, 17682, 17683, 17722, 17822, 17826

ELECTRICAL RESISTANCE
17146, 17221, 17222, 17297, 17304, 17333, 17339, 17346, 17451

ELECTRICITY (ATMOSPHERIC)
17561

ELECTROCHEMICAL METHODS
17298, 17412, 17437, 17443, 17449, 17454, 17466, 17475, 17504, 17515, 17524, 17526, 17549, 17697

ELECTROCONDUCTIVITY ANALYZERS
17453, 17467, 17475, 17477, 17485, 17504, 17516, 17518

ELECTROLYSIS
17366, 17449, 17475

ELECTRON MICROSCOPY
17456, 17492, 17498, 17529, 17687, 17701

ELECTROSTATIC AEROSOL GENERATORS
17435

ELECTROSTATIC PRECIPITATORS
17069, 17077, 17107, 17136, 17137, 17146, 17160, 17162, 17191, 17193, 17206, 17208, 17218, 17221, 17222, 17223, 17224, 17229, 17235, 17236, 17241, 17254, 17258, 17268, 17269, 17278, 17279, 17280, 17289, 17297, 17302, 17304, 17315, 17324, 17333, 17339, 17346, 17347, 17361, 17367, 17376, 17391, 17395, 17411, 17413, 17438, 17454, 17541, 17546, 17689, 17831, 17835, 17903

EMISSION INVENTORIES
17037, 17062, 17079, 17084, 17102, 17157, 17251, 17446, 17536, 17537, 17576, 17851, 17872, 17881, 17885, 17888

EMISSION STANDARDS
17044, 17046, 17076, 17115, 17144, 17147, 17152, 17178, 17204, 17219, 17237, 17252, 17263, 17311, 17321, 17350, 17408, 17453, 17480, 17499, 17532, 17546, 17782, 17828, 17836, 17839, 17840, 17841, 17843, 17846, 17847, 17863, 17881, 17888, 17889, 17894, 17895, 17898, 17903

EMISSIVITY
17445, 17489

EMPHYSEMA
17713, 17733, 17736, 17753, 17766, 17774

ENFORCEMENT PROCEDURES
17421, 17499, 17703, 17856, 17859, 17867, 17873, 17877, 17890, 17891, 17894, 17897, 17898

ENGINE DESIGN MODIFICATION
17033, 17044, 17045, 17051, 17076, 17085, 17090, 17098, 17158, 17169, 17204, 17252, 17263, 17321, 17328, 17398, 17403, 17406, 17407, 17408

ENGINE OPERATING CYCLES
17039, 17043, 17064, 17078, 17085, 17086, 17087, 17098, 17114, 17134, 17152, 17204, 17251, 17259, 17276, 17316, 17317, 17353, 17403, 17406, 17478, 17532, 17655

ENGINE OPERATION MODIFICATION
17036, 17039, 17045, 17057, 17059, 17064, 17065, 17068, 17089, 17098, 17114, 17118, 17124, 17125, 17132, 17134, 17141, 17148, 17152, 17166, 17178, 17198, 17204, 17235, 17237, 17245, 17251, 17252, 17259, 17263, 17276, 17311, 17313, 17316, 17317, 17322, 17326, 17328, 17337, 17364, 17379, 17384, 17387, 17397, 17398, 17403, 17406, 17408, 17451

ENGINEERS
17850, 17895

ENZYMES
17047, 17468, 17676, 17705, 17706, 17714, 17724, 17736, 17745, 17754, 17758, 17767, 17777, 17783

EPIDEMIOLOGY
17713, 17722, 17731, 17749, 17751, 17766, 17768, 17770, 17779, 17837

EPITHELIUM
17750

EQUIPMENT CRITERIA
17029, 17084, 17193, 17221, 17229, 17231, 17236, 17267, 17279, 17287, 17296, 17306, 17311, 17315, 17340, 17422, 17438, 17444, 17479, 17524, 17531, 17835, 17838, 17842, 17895

EQUIPMENT STANDARDS
17261, 17842, 17843, 17850, 17889

ESTERS
17101, 17343, 17396

ETHNIC FACTORS
17751

ETHYL ALCOHOL
17378

ETHYLENE
17101, 17142, 17488, 17489, 17491, 17685, 17789, 17803

EUROPE
17029, 17047, 17055, 17056, 17059, 17061, 17063, 17065, 17067, 17074, 17080, 17081, 17083, 17089, 17090, 17093, 17098, 17100, 17102, 17105, 17107, 17109, 17110, 17111, 17113, 17120, 17123, 17130, 17139, 17145, 17148, 17155, 17156, 17159, 17160, 17161, 17166, 17168, 17175, 17180, 17185, 17190, 17192, 17193, 17195, 17199, 17202, 17203, 17205, 17206, 17210, 17212, 17213, 17215, 17216, 17220, 17221, 17223, 17226, 17227, 17228, 17231, 17235, 17236, 17239, 17243, 17245, 17246, 17253, 17254, 17259, 17260, 17262, 17263, 17265, 17268, 17276, 17278, 17279, 17281, 17286, 17289, 17291, 17292, 17296, 17297, 17298, 17299, 17311, 17315, 17327, 17330, 17332, 17335, 17337, 17340, 17341, 17345, 17355, 17358, 17359, 17362, 17365, 17366, 17368, 17370, 17373, 17384, 17392, 17396, 17399, 17400, 17402, 17412,

17413, 17417, 17422, 17424, 17427, 17428, 17429, 17432, 17437, 17440, 17444, 17448, 17449, 17450, 17455, 17458, 17461, 17463, 17468, 17471, 17473, 17477, 17481, 17483, 17487, 17494, 17495, 17496, 17500, 17501, 17509, 17513, 17514, 17516, 17518, 17520, 17523, 17525, 17532, 17540, 17542, 17544, 17546, 17547, 17548, 17551, 17554, 17555, 17558, 17559, 17563, 17568, 17572, 17576, 17577, 17578, 17579, 17582, 17583, 17587, 17588, 17589, 17591, 17594, 17597, 17599, 17600, 17605, 17612, 17616, 17618, 17619, 17621, 17622, 17623, 17628, 17630, 17634, 17639, 17640, 17642, 17647, 17650, 17651, 17653, 17664, 17665, 17666, 17672, 17673, 17674, 17677, 17680, 17686, 17689, 17691, 17696, 17697, 17698, 17704, 17705, 17708, 17711, 17714, 17716, 17718, 17723, 17725, 17726, 17728, 17729, 17737, 17738, 17739, 17743, 17746, 17750, 17755, 17756, 17761, 17762, 17763, 17766, 17770, 17771, 17772, 17775, 17778, 17782, 17785, 17788, 17793, 17795, 17796, 17797, 17800, 17802, 17808, 17809, 17810, 17811, 17813, 17819, 17820, 17822, 17826, 17844, 17845, 17846, 17848, 17857, 17860, 17861, 17863, 17867, 17868, 17870, 17878, 17883, 17887, 17889, 17891, 17893, 17895, 17897, 17900, 17904, 17905

EVAPORATORS
17381, 17388

EXCESS AIR
17108, 17129, 17150, 17163, 17234, 17254, 17304, 17332, 17337, 17362, 17403, 17842

EXCRETIONS
17704, 17707, 17708, 17712, 17720, 17785, 17786

EXHAUST SYSTEMS
17091, 17160, 17172, 17180, 17212, 17232, 17238, 17239, 17245, 17250, 17253, 17282, 17307, 17338, 17351, 17382, 17397, 17401, 17405, 17455, 17523, 17568

EXPERIMENTAL EQUIPMENT
17052, 17090, 17121, 17311, 17338, 17423, 17427, 17429, 17447, 17517, 17664

EXPERIMENTAL METHODS
17097, 17308, 17311, 17354, 17418, 17423, 17425, 17426, 17431, 17432, 17439, 17442, 17444, 17448, 17451, 17459, 17462, 17463, 17464, 17465, 17503, 17525, 17529, 17612, 17619, 17630, 17664, 17666, 17668, 17670, 17685, 17691, 17693, 17706, 17721

EXPLOSIONS
17048, 17081, 17135, 17232, 17401, 17637

EXPOSURE CHAMBERS
17780, 17790

EXPOSURE METHODS
17701, 17706, 17709, 17714, 17724, 17725, 17730, 17736, 17743, 17744, 17749, 17764, 17785, 17786, 17789, 17790, 17798, 17816, 17820

EYE IRRITATION
17110, 17142, 17157, 17702, 17710, 17711, 17733, 17846, 17857

EYES
17142, 17710, 17733, 17763, 17846

F

FALLOUT
17102

FANS (BLOWERS)
17091, 17160, 17172, 17180, 17232, 17239, 17250, 17253, 17307, 17351, 17382, 17405, 17455, 17568

FARMS
17069, 17094, 17544, 17570, 17785, 17875

FEASIBILITY STUDIES
17043, 17076, 17133, 17138, 17190, 17299, 17311, 17321, 17344, 17369, 17386, 17445, 17457, 17638, 17841

FEDERAL GOVERNMENTS
17263, 17321, 17350, 17380, 17420, 17421, 17703, 17828, 17839, 17841, 17853, 17856, 17866, 17869, 17885, 17890, 17892, 17898

FEES
17867, 17898

FERTILIZER MANUFACTURING
17040, 17058, 17110, 17116, 17146, 17198, 17284, 17807

FERTILIZING
17235, 17479

FIELD TESTS
17052, 17125, 17130, 17131, 17337, 17349, 17427, 17433, 17502, 17524, 17822, 17825

FILTER FABRICS
17077, 17146, 17160, 17164, 17193, 17205, 17208, 17210, 17229, 17239, 17299, 17359, 17376, 17439, 17442, 17454, 17802

FILTERS
17069, 17077, 17115, 17135, 17136, 17137, 17146, 17160, 17164, 17179, 17180, 17187, 17193, 17196, 17205, 17208, 17210, 17221, 17229, 17231, 17236, 17238, 17239, 17240, 17253, 17254, 17256, 17257, 17258, 17260, 17269, 17270, 17275, 17280, 17287, 17288, 17289, 17299, 17306, 17315, 17327, 17330, 17332, 17335, 17338, 17359, 17367, 17370, 17373, 17375, 17376, 17391, 17404, 17409, 17412, 17439, 17442, 17444, 17454, 17455, 17478, 17495, 17508, 17511, 17531, 17543, 17570, 17802, 17823, 17835

FIRING METHODS
17065, 17098, 17108, 17120, 17129, 17134, 17141, 17145, 17150, 17163, 17179, 17202, 17214, 17226, 17234, 17245, 17246, 17248, 17250, 17252, 17254, 17271, 17304, 17317, 17322, 17324, 17326, 17328, 17332, 17337, 17362, 17364, 17379, 17384, 17403, 17741, 17842

FLAME AFTERBURNERS
17204, 17252, 17263, 17311, 17328, 17831

FLAME IONIZATION DETECTOR
17415, 17454, 17462, 17473, 17478, 17479, 17480, 17493, 17515, 17526

FLARES
17303, 17598

FLOUR PROCESSING
17537

FLOWERS
17809

FLOWMETERS
17453, 17454

FLUID FLOW
17026, 17065, 17093, 17134, 17141, 17146, 17168, 17170, 17179, 17190, 17197, 17203, 17220, 17224, 17228, 17230, 17239, 17242, 17261, 17268, 17269, 17270, 17271, 17275, 17295, 17299, 17300, 17301, 17306, 17319, 17341, 17361, 17368, 17383, 17392, 17400, 17401, 17402, 17403, 17438, 17439, 17446, 17451, 17454, 17478, 17481, 17484, 17492, 17496, 17505, 17534, 17583, 17624, 17636, 17638, 17656, 17657, 17660, 17667, 17674, 17675, 17682, 17689, 17692, 17695, 17715, 17769, 17842

FLUORESCENCE
17123, 17128, 17354, 17442, 17450, 17465, 17472, 17473, 17479, 17488, 17489, 17490, 17494, 17630, 17654, 17760, 17799

FLUORIDES
17040, 17058, 17097, 17110, 17192, 17229, 17413, 17454, 17514, 17527, 17531, 17685, 17711, 17763, 17803, 17811, 17818, 17893

FLUORINATED HYDROCARBONS
17685

FLUORINE
17221, 17802, 17811

FLUORINE COMPOUNDS
17040, 17058, 17097, 17110, 17192, 17196, 17229, 17413, 17454, 17514, 17527, 17531, 17685, 17711, 17763, 17802, 17803, 17806, 17807, 17808, 17809, 17811, 17818, 17893

FLY ASH
17077, 17108, 17113, 17202, 17220, 17234, 17249, 17254, 17333, 17339, 17346, 17364, 17395, 17410, 17679, 17811, 17825

FOG
17109, 17111, 17486, 17577, 17579, 17594, 17599, 17612, 17616, 17634, 17638, 17645, 17762

FOOD AND FEED OPERATIONS
17069, 17116, 17123, 17146, 17320, 17375, 17405, 17537, 17544, 17570, 17875

FOODS
17493, 17522, 17703, 17716, 17740, 17741, 17750, 17784, 17785, 17811

FORESTS
17545, 17547, 17548, 17587, 17809, 17813

FORMALDEHYDES
17131, 17142, 17491, 17568, 17572, 17650

FRACTIONATION
17094, 17677

FRANCE
17029, 17059, 17155, 17166, 17193, 17212, 17215, 17221, 17236, 17279, 17311, 17315, 17327, 17340, 17422, 17449, 17450, 17455, 17483, 17582, 17599, 17642, 17775, 17793, 17819, 17848, 17868, 17889, 17897

FREE RADICALS
17050, 17694

FREEZING
17454, 17665

FROTH FLOATATION
17230

FRUITS
17793, 17802, 17804, 17806, 17807

FUEL ADDITIVES
17039, 17042, 17070, 17073, 17078, 17086, 17098, 17119, 17124, 17127, 17155, 17223, 17226, 17254, 17264, 17281, 17304, 17371, 17378, 17389, 17562, 17655, 17830

FUEL CELLS
17119, 17133, 17234

FUEL CHARGING
17250, 17332, 17384

FUEL CRITERIA
17059, 17279, 17340, 17889

FUEL EVAPORATION
17204, 17252, 17322, 17331, 17340, 17536

FUEL GASES
17026, 17037, 17041, 17055, 17059, 17067, 17102, 17105, 17106, 17112, 17114, 17118,

17120, 17125, 17132, 17144, 17146, 17201, 17244, 17313, 17323, 17358, 17362, 17496, 17520, 17536, 17537, 17582, 17650, 17665, 17847, 17850, 17861, 17897

FUEL OIL PREPARATION
17070, 17106, 17154, 17200, 17272, 17273, 17274, 17279, 17293, 17294, 17300, 17301, 17334, 17340, 17354

FUEL OILS
17026, 17037, 17039, 17046, 17059, 17065, 17080, 17088, 17102, 17106, 17107, 17112, 17114, 17138, 17140, 17144, 17146, 17154, 17168, 17191, 17200, 17202, 17206, 17226, 17253, 17267, 17272, 17273, 17274, 17279, 17293, 17294, 17300, 17301, 17304, 17313, 17332, 17334, 17336, 17340, 17363, 17536, 17537, 17564, 17650, 17764, 17850, 17861, 17889, 17894, 17897

FUEL STANDARDS
17843, 17889

FUEL TANK EVAPORATION
17331

FUMES
17036, 17057, 17077, 17081, 17115, 17142, 17160, 17174, 17185, 17236, 17290, 17531, 17781, 17856

FUNGI
17083, 17678

FURNACES
17029, 17036, 17055, 17065, 17077, 17079, 17080, 17082, 17096, 17130, 17140, 17145, 17150, 17154, 17156, 17160, 17170, 17172, 17173, 17191, 17193, 17206, 17212, 17221, 17226, 17227, 17232, 17234, 17236, 17267, 17279, 17282, 17289, 17290, 17295, 17304, 17315, 17329, 17332, 17333, 17336, 17337, 17368, 17401, 17442, 17454, 17523, 17541, 17546, 17839, 17847, 17863, 17868, 17889

G

GAMMA RADIATION
17469, 17560

GAS CHROMATOGRAPHY
17123, 17353, 17415, 17416, 1744[illegible], 17450, 17453, 17454, 17460, 17462, 17473, 17478, 17479, 17480, 17493, 17504, 17510, 17515, 17520, 17521, 17524, 17526, 17728, 17877

GAS SAMPLING
17042, 17265, 17433, 17436, 17437, 17454, 17458, 17500, 17515, 17518, 17674

GAS TURBINES
17026, 17028, 17059, 17067, 17071, 17137, 17151, 17158, 17202, 17328, 17374, 17415, 17506

GASIFICATION (SYNTHESIS)
17213, 17284, 17323

GASOLINES
17032, 17037, 17039, 17045, 17047, 17070, 17073, 17078, 17086, 17089, 17106, 17114, 17118, 17119, 17124, 17125, 17127, 17132, 17143, 17147, 17155, 17169, 17178, 17197, 17264, 17331, 17371, 17378, 17389, 17537, 17562, 17564, 17650, 17740, 17782, 17830, 17850

GENETICS
17748

GEORGIA
17566

GERMANY
17047, 17065, 17080, 17083, 17089, 17090, 17109, 17110, 17139, 17156, 17175, 17199, 17202, 17203, 17205, 17206, 17210, 17226, 17227, 17228, 17243, 17253, 17276, 17278, 17292, 17296, 17297, 17330, 17332, 17335, 17359, 17368, 17396, 17399, 17400, 17402, 17424, 17437, 17463, 17477, 17509, 17513, 17518, 17523, 17532, 17546, 17554, 17568, 17605, 17612, 17618, 17647, 17677, 17691, 17739, 17743, 17772, 17778, 17788, 17808, 17811, 17820, 17846, 17857, 17863, 17870, 17878, 17893, 17904

GLANDS
17743, 17765, 17786

GLASS FABRICS
17439, 17442, 17802

GOATS
17808

GRAIN PROCESSING
17069, 17146, 17537

GRANTS
17849, 17853

GRASSES
17214, 17443, 17678, 17793, 17834

GRAVITY SETTLING
17208, 17260, 17438, 17513, 17606, 17659, 17666

GREAT BRITAIN
17056, 17061, 17063, 17067, 17081, 17098, 17100, 17111, 17120, 17145, 17148, 17159, 17160, 17168, 17195, 17213, 17223, 17235, 17254, 17260, 17262, 17263, 17281, 17298, 17345, 17355, 17370, 17417, 17427, 17428, 17429, 17444, 17448, 17495, 17496, 17540, 17544, 17551, 17577, 17578, 17579, 17583, 17587, 17597, 17616, 17623, 17634, 17639, 17651, 17666, 17672, 17673, 17680, 17697, 17705, 17708, 17711, 17718, 17723, 17726, 17728, 17746, 17756, 17762, 17766, 17770, 17771, 17785, 17810, 17861, 17887, 17891, 17895, 17900

GREENHOUSES
17814, 17815

GROUND LEVEL
17058, 17084, 17111, 17202, 17534, 17547, 17553, 17571, 17572, 17584, 17586, 17591, 17594, 17598, 17603, 17614, 17635, 17656, 17887

GUINEA PIGS
17725, 17744, 17764

H

HALOGEN GASES
17221, 17242, 17267, 17349, 17366, 17449, 17475, 17508, 17510, 17516, 17677, 17787, 17801, 17802, 17811

HALOGENATED HYDROCARBONS
17101, 17491, 17570, 17685, 17728

HAWAII
17553, 17620

HAZE
17042, 17109, 17264, 17486, 17540, 17574, 17587, 17594, 17638, 17857, 17891

HEADACHE
17109, 17142, 17699, 17781

HEALTH IMPAIRMENT
17034, 17035, 17042, 17121, 17142, 17314, 17539, 17699, 17702, 17782, 17808, 17832, 17837, 17840, 17848

HEALTH STATISTICS
17723, 17727, 17733, 17742, 17751, 17753, 17759, 17762, 17766, 17768, 17770, 17774

HEARINGS
17840, 17858, 17896

HEART
17710, 17729, 17732, 17786

HEAT CAPACITY
17070, 17696

HEAT OF COMBUSTION
17114, 17326, 17504, 17686, 17691

HEAT TRANSFER
17033, 17036, 17080, 17082, 17129, 17144, 17150, 17159, 17170, 17172, 17174, 17178, 17179, 17198, 17202, 17207, 17232, 17244, 17251, 17284, 17290, 17368, 17388, 17396, 17404, 17454, 17459, 17575, 17652, 17665, 17666, 17675, 17820

HEIGHT FINDING
17534, 17636

HEMATOLOGY
17109, 17435, 17570, 17572, 17720, 17721, 17730, 17737, 17746, 17750, 17756, 17757, 17760, 17767, 17768, 17772, 17783, 17791, 17792

HEMOGLOBIN INTERACTIONS
17746, 17750, 17767, 17792

HEXANES
17441, 17714

HI-VOL SAMPLERS
17479, 17499, 17543, 17550, 17699

HIGHWAYS
17031, 17047, 17110, 17350, 17564, 17804, 17812, 17883

HISTAMINES
17760

HORMONES
17435, 17789

HUMIDITY
17072, 17083, 17108, 17110, 17146, 17191, 17260, 17265, 17359, 17360, 17393, 17454, 17458, 17535, 17538, 17540, 17545, 17547, 17565, 17578, 17580, 17594, 17596, 17597, 17601, 17645, 17649, 17652, 17661, 17662, 17727, 17793, 17821, 17823, 17827, 17865

HYDROCHLORIC ACID
17034, 17083, 17182, 17189, 17233, 17267, 17475, 17702, 17801

HYDROCYANIC ACID
17083, 17255, 17267, 17475, 17500, 17539, 17780

HYDRODESULFURIZATION
17106, 17154, 17200, 17272, 17273, 17274, 17293, 17294, 17300, 17301, 17334, 17354

HYDROFLUORIC ACID
17034, 17416, 17475, 17539, 17711, 17787, 17793, 17801, 17806, 17809, 17811

HYDROGEN
17081, 17083, 17113, 17198, 17233, 17264, 17301, 17357, 17390, 17462, 17554, 17615, 17685

HYDROGEN SULFIDE
17063, 17069, 17071, 17083, 17104, 17159, 17194, 17201, 17211, 17218, 17233, 17255, 17262, 17270, 17284, 17324, 17396, 17412, 17433, 17436, 17437, 17441, 17454, 17475, 17488, 17489, 17520, 17524, 17526, 17558, 17563, 17572, 17573, 17787, 17818, 17823, 17846, 17878

HYDROGENATION
17194, 17377

HYDROLYSIS
17184, 17272, 17514

HYDROSPHERE
17545, 17567, 17626, 17633

HYDROXIDES
17199, 17292, 17615

HYPOXIA
17109

I

ICE
17459, 17633

ILLINOIS
17460, 17566, 17821

IMMUNOLOGY
17730, 17748

IMPINGERS
17136, 17242, 17437, 17438, 17454, 17482, 17550, 17706, 17835

INCINERATION
17027, 17029, 17032, 17037, 17038, 17052, 17063, 17075, 17096, 17130, 17137, 17139, 17146, 17174, 17179, 17189, 17192, 17218, 17238, 17250, 17255, 17267, 17271, 17290, 17307, 17320, 17343, 17351, 17364, 17368, 17454, 17536, 17678, 17740, 17831, 17833, 17842, 17856, 17889

INDUSTRIAL AREAS
17037, 17046, 17055, 17056, 17094, 17109, 17110, 17116, 17473, 17535, 17539, 17548, 17550, 17551, 17552, 17557, 17559, 17563, 17572, 17598, 17713, 17794, 17802, 17809, 17823, 17826, 17859, 17860, 17866, 17874, 17876, 17878, 17886

INDUSTRIAL EMISSION SOURCES
17026, 17027, 17029, 17030, 17032, 17034, 17035, 17036, 17037, 17038, 17040, 17047, 17052, 17053, 17055, 17056, 17058, 17059, 17060, 17062, 17063, 17066, 17069, 17071, 17075, 17077, 17079, 17080, 17081, 17082, 17083, 17088, 17091, 17092, 17094, 17096, 17102, 17105, 17106, 17110, 17112, 17113, 17115, 17116, 17120, 17122, 17123, 17130, 17135, 17137, 17138, 17139, 17140, 17142, 17144, 17146, 17147, 17149, 17160, 17165, 17171, 17172, 17174, 17177, 17179, 17180, 17189, 17191, 17192, 17193, 17198, 17199, 17202, 17206, 17212, 17213, 17217, 17218, 17219, 17220, 17221, 17224, 17227, 17232, 17234, 17235, 17236, 17238, 17243, 17244, 17249, 17250, 17255, 17264, 17265, 17266, 17267, 17271, 17277, 17279, 17280, 17284, 17286, 17287, 17290, 17296, 17302, 17303, 17307, 17314, 17315, 17320, 17323, 17324, 17325, 17329, 17331, 17333, 17337, 17340, 17342, 17343, 17345, 17351, 17352, 17361, 17362, 17364, 17366, 17368, 17369, 17372, 17374, 17375, 17384, 17385, 17388, 17389, 17394, 17401, 17404, 17405, 17410, 17413, 17421, 17446, 17453, 17454, 17473, 17482, 17498, 17501, 17502, 17514, 17531, 17536, 17537, 17541, 17543, 17544, 17546, 17548, 17551, 17552, 17557, 17558, 17559, 17563, 17569, 17570, 17573, 17575, 17576, 17586, 17590, 17598, 17607, 17608, 17627, 17650, 17652, 17659, 17661, 17662, 17665, 17672, 17673, 17678, 17711, 17712, 17713, 17718, 17722, 17723, 17728, [illegible], 17740, 17772, 17778, 17781, 17788, [illegible], 17802, 17805, 17807, 17813, 17818, 17825, 17828, 17830, 17831, 17833, 17836, 17839, 17842, 17847, 17848, 17850, 17855, 17856, 17859, 17861, 17863, 17864, 17866, 17867, 17868, 17871, 17874, 17875, 17887, 17889, 17892, 17894, 17897, 17899, 17904

INERTIAL SEPARATION
17137, 17195, 17208, 17269, 17392, 17438, 17492

INFECTIOUS DISEASES
17803

INFLUENZA
17730

INFRARED RADIATION
17419, 17691

INFRARED SPECTROMETRY
17309, 17355, 17415, 17419, 17443, 17459, 17478, 17479, 17480, 17490, 17492, 17512, 17526, 17530, 17790

INGESTION
17703, 17707, 17716, 17717, 17719, 17732, 17741, 17750, 17757, 17785, 17791, 17792, 17808, 17853

INHIBITION
17464, 17745

INORGANIC ACIDS
17034, 17060, 17082, 17083, 17102, 17108, 17167, 17181, 17182, 17185, 17189, 17190, 17192, 17198, 17206, 17207, 17209, 17233, 17243, 17249, 17254, 17265, 17267, 17277, 17304, 17312, 17314, 17337, 17341, 17361, 17363, 17372, 17374, 17381, 17388, 17396, 17410, 17416, 17422, 17475, 17539, 17572, 17665, 17668, 17677, 17702, 17711, 17787, 17793, 17801, 17806, 17809, 17811, 17822, 17828, 17836, 17842

INSPECTION
17057, 17173, 17335, 17476, 17843, 17855, 17889

INSPECTORS
17535

INSTRUCTORS
17158

INSTRUMENTATION
17057, 17418, 17426, 17430, 17433, 17441, 17446, 17452, 17454, 17466, 17474, 17475, 17477, 17479, 17480, 17481, 17487, 17504, 17506, 17508, 17511, 17526, 17527, 17530, 17588, 17589, 17624, 17631

INTERMITTENT MONITORING
17527

INTERNAL COMBUSTION ENGINES
17033, 17037, 17045, 17051, 17055, 17057, 17067, 17068, 17073, 17076, 17089, 17098, 17103, 17119, 17125, 17128, 17132, 17140, 17141, 17148, 17158, 17166, 17169, 17176, 17178, 17245, 17246, 17248, 17259, 17276, 17281, 17313, 17317, 17321, 17322, 17326, 17328, 17353, 17367, 17379, 17384, 17397, 17398, 17403, 17406, 17407, 17440, 17506, 17532, 17536, 17537, 17782, 17854, 17856, 17889

INTESTINES
17786

INVERSION
17572, 17584, 17590, 17594, 17605, 17634, 17834

IODIMETRIC METHODS
17437, 17452, 17454, 17491, 17558

IODINE
17449

IODINE COMPOUNDS
17668, 17675

IONIZATION
17222, 17391, 17617, 17647, 17668, 17681, 17688, 17822

IONS
17113, 17377, 17435, 17457, 17474, 17477, 17514, 17516, 17554, 17561, 17645, 17668, 17683, 17688, 17722, 17824

IRELAND
17795

IRON
17040, 17075, 17077, 17079, 17081, 17146, 17160, 17178, 17189, 17213, 17221, 17227, 17236, 17266, 17315, 17329, 17333, 17375, 17401, 17501, 17537, 17559, 17820, 17821, 17822, 17827, 17868, 17889

IRON COMPOUNDS
17127, 17190, 17224, 17266, 17349, 17492, 17560, 17572, 17672, 17745, 17764, 17802, 17822

IRON OXIDES
17236, 17551, 17693, 17824, 17868

IRRADIATION CHAMBERS
17654

ISOTOPES
17222, 17308, 17399, 17434, 17448, 17469, 17470, 17525, 17635, 17675, 17712

ITALY
17440, 17630, 17704, 17725, 17737

J

JAPAN
17046, 17101, 17102, 17106, 17114, 17134, 17142, 17143, 17154, 17167, 17169, 17171, 17177, 17179, 17181, 17186, 17187, 17188, 17251, 17255, 17256, 17257, 17266, 17267, 17269, 17270, 17271, 17272, 17273, 17274, 17277, 17282, 17283, 17293, 17294, 17300, 17301, 17312, 17316, 17317, 17318, 17319, 17324, 17325, 17329, 17334, 17336, 17351, 17353, 17354, 17361, 17363, 17377, 17379, 17380, 17381, 17387, 17388, 17389, 17390, 17391, 17406, 17407, 17410, 17416, 17434, 17467, 17475, 17476, 17486, 17521, 17527, 17533, 17534, 17535, 17539, 17550, 17551, 17552, 17557, 17560, 17564, 17569, 17629, 17636, 17648, 17662, 17663, 17667, 17699, 17701, 17733, 17734, 17744, 17747, 17748, 17753, 17759, 17760, 17774, 17780, 17781, 17784, 17801, 17805, 17823, 17824, 17827, 17835, 17846, 17847, 17849, 17850, 17854, 17855, 17865, 17874, 17876, 17877, 17879, 17886, 17894

JET AIRCRAFT
17028, 17580, 17596

K

KANSAS
17537

KEROSENE
17106, 17274

KETONES
17083, 17342, 17343, 17610, 17752, 17756

KIDNEYS
17142, 17707, 17716, 17719, 17729, 17740, 17765, 17785, 17786

KILNS
17069, 17120, 17146, 17165, 17193, 17267, 17277, 17279, 17286, 17302, 17333, 17369, 17454, 17874

KRAFT PULPING
17060, 17149, 17302, 17324, 17325, 17333, 17453, 17454, 17541

L

LABORATORY ANIMALS
17670, 17701, 17704, 17709, 17710, 17712, 17714, 17724, 17725, 17728, 17729, 17730, 17736, 17743, 17744, 17746, 17749, 17758, 17761, 17764, 17777, 17780, 17786

LABORATORY FACILITIES
17046, 17131, 17339, 17611, 17796, 17820

LACQUERS
17343

LAKES
17606, 17663

LAPSE CONDITION
17595, 17601

LARYNGITIS
17572

LASERS
17423, 17447, 17486, 17497, 17533, 17612, 17619, 17638, 17698

LEAD
17115, 17180, 17266, 17672, 17673, 17865

LEAD COMPOUNDS
17039, 17043, 17047, 17056, 17070, 17073, 17078, 17082, 17085, 17086, 17094, 17102, 17104, 17110, 17115, 17124, 17125, 17127, 17142, 17143, 17147, 17155, 17163, 17169, 17178, 17197, 17212, 17242, 17254, 17264, 17266, 17292, 17349, 17371, 17378, 17389, 17408, 17409, 17492, 17498, 17549, 17550, 17553, 17556, 17559, 17562, 17606, 17655, 17672, 17699, 17700, 17703, 17704, 17707, 17708, 17709, 17712, 17716, 17717, 17718, 17719, 17720, 17721, 17732, 17740, 17741, 17745, 17746, 17756, 17757, 17765, 17768, 17772, 17782, 17785, 17786, 17791, 17792, 17802, 17804, 17812, 17830, 17850, 17853, 17893, 17900

LEAD PEROXIDE CANDLE
17426, 17535, 17548, 17557, 17699

LEAVES
17787, 17789, 17793, 17794, 17798, 17801, 17802, 17803, 17814, 17817

LEGISLATION
17066, 17081, 17102, 17147, 17149, 17155, 17166, 17252, 17263, 17331, 17350, 17369, 17371, 17421, 17539, 17753, 17759, 17766, 17774, 17832, 17841, 17842, 17847, 17848, 17851, 17853, 17856, 17858, 17859, 17863, 17867, 17869, 17873, 17875, 17877, 17879, 17881, 17884, 17885, 17887, 17889, 17890, 17891, 17893, 17895, 17897, 17898, 17903

LEUKOCYTES
17743

LIGHT SCATTERING
17395, 17456, 17483, 17486, 17502, 17513, 17565, 17655

LIME
17069, 17146, 17165, 17193, 17277, 17279, 17286, 17369, 17454

LIMESTONE
17102, 17219, 17344, 17352, 17369, 17385

LINE SOURCES
17583, 17629, 17632

LIPIDS
17435

LIQUIDS
17029, 17083, 17103, 17165, 17201, 17216, 17249, 17272, 17319, 17327, 17347, 17355, 17356, 17459, 17577, 17579, 17581, 17592, 17630, 17645, 17649, 17652, 17677, 17682, 17698, 17740, 17820

LITHIUM COMPOUNDS
17133, 17242, 17308, 17854

LITIGATION
17869, 17873

LIVER
17142, 17709, 17714, 17728, 17765, 17777, 17783, 17785, 17791, 17792

LOCAL GOVERNMENTS
17420, 17539, 17703, 17853, 17859, 17869, 17874, 17885, 17890

LONDON
17551, 17616, 17623, 17634

LOS ANGELES
17028, 17036, 17115, 17157, 17524, 17538, 17551, 17602, 17738, 17812, 17821

LOUISIANA
17821

LOWER ATMOSPHERE
17564, 17567, 17581, 17588, 17589, 17591, 17635, 17656

LUBRICANTS
17237, 17476

LUNG CANCER
17723, 17733, 17742, 17749, 17755, 17762, 17764, 17770, 17771

LUNGS
17142, 17464, 17724, 17729, 17730, 17736, 17743, 17755, 17761, 17764, 17777, 17778

M

MAGNESIUM
17115

MAGNESIUM COMPOUNDS
17226, 17369, 17531, 17809

MAGNETOHYDRODYNAMICS (MHD)
17092

MAINTENANCE
17057, 17058, 17080, 17152, 17162, 17173, 17176, 17180, 17196, 17212, 17217, 17220, 17256, 17257, 17275, 17285, 17287, 17288, 17299, 17318, 17320, 17359, 17370, 17371, 17404, 17405, 17410, 17451, 17459, 17476, 17826, 17831, 17836, 17843

MANAGEMENT PERSONNEL
17855

MANGANESE
17755

MANGANESE COMPOUNDS
17190, 17254, 17304, 17314, 17363, 17508, 17551, 17559, 17560, 17802

MANGANESE DIOXIDE (JAPANESE)
17102, 17277, 17283, 17363

MANGANESE SULFATES
17190

MAPPING
17037, 17536, 17537, 17860

MARYLAND
17173, 17769

MASS SPECTROMETRY
17447, 17450, 17454, 17474

MASS TRANSPORTATION
17321, 17350, 17872

MASSACHUSETTS
17173, 17562

MATHEMATICAL ANALYSES
17048, 17068, 17084, 17093, 17111, 17145, 17148, 17203, 17208, 17224, 17230, 17239, 17258, 17305, 17319, 17348, 17362, 17383, 17466, 17505, 17534, 17581, 17585, 17586, 17588, 17589, 17604, 17606, 17610, 17612, 17614, 17622, 17625, 17637, 17647, 17648, 17650, 17656, 17669, 17671, 17675, 17680, 17681, 17682, 17684, 17689, 17690, 17692, 17695, 17696, 17810, 17830, 17844

MATHEMATICAL MODELING
17145, 17224, 17230, 17305, 17348, 17505, 17585, 17588, 17589, 17606, 17610, 17637, 17647, 17656, 17671, 17681, 17682, 17689, 17692, 17830

MAXIMUM ALLOWABLE CONCENTRATION
17036, 17046, 17083, 17109, 17142, 17166, 17193, 17280, 17408, 17461, 17546, 17560, 17568, 17572, 17586, 17590, 17650, 17702, 17775, 17835, 17844, 17845, 17846, 17863, 17870, 17893, 17903

MBTH METHOD
17415

MEDICAL FACILITIES
17568

MEDICAL PERSONNEL
17713, 17759, 17776, 17880

MEETINGS
17048, 17123, 17905

MEMBRANE FILTERS
17215, 17229, 17414, 17443, 17479, 17560, 17562, 17603, 17630

MEMBRANES
17142, 17702, 17705, 17711, 17743, 17744, 17745

MERCAPTANS
17201, 17221, 17320, 17324, 17342, 17436, 17437, 17454, 17520, 17524

MERCURY
17755

MERCURY COMPOUNDS
17095, 17171, 17431, 17479, 17491, 17503, 17508, 17522, 17525, 17560, 17700, 17725, 17737, 17746, 17765, 17784, 17840

METABOLISM
17572, 17704, 17709, 17716, 17737, 17747, 17749, 17777, 17789, 17792, 17808

METAL COMPOUNDS
17030, 17039, 17040, 17043, 17047, 17048, 17053, 17056, 17066, 17068, 17070, 17073, 17077, 17078, 17082, 17085, 17086, 17094, 17095, 17102, 17104, 17110, 17115, 17124, 17125, 17127, 17129, 17133, 17142, 17143, 17147, 17153, 17155, 17159, 17161, 17163, 17165, 17167, 17169, 17171, 17177, 17178, 17182, 17183, 17184, 17185, 17190, 17194, 17197, 17199, 17206, 17209, 17212, 17213, 17219, 17222, 17223, 17224, 17226, 17229, 17231, 17233, 17242, 17254, 17255, 17262, 17264, 17265, 17266, 17272, 17273, 17281, 17283, 17286, 17292, 17293, 17294, 17300, 17301, 17304, 17308, 17309, 17314, 17315, 17325, 17326, 17341, 17345, 17348, 17349, 17354, 17363, 17365, 17366, 17369, 17371, 17376, 17378, 17384, 17386, 17388, 17389, 17390, 17408, 17409, 17410, 17413, 17431, 17432, 17444, 17469, 17470, 17479, 17482, 17491, 17492, 17498, 17503, 17508, 17514,

17522, 17525, 17531, 17541, 17549, 17550, 17551, 17552, 17553, 17555, 17556, 17559, 17560, 17562, 17572, 17592, 17597, 17606, 17653, 17655, 17672, 17675, 17699, 17700, 17703, 17704, 17707, 17708, 17709, 17712, 17716, 17717, 17718, 17719, 17720, 17721, 17722, 17725, 17732, 17737, 17740, 17741, 17743, 17745, 17746, 17756, 17757, 17764, 17765, 17767, 17768, 17772, 17781, 17782, 17784, 17785, 17786, 17791, 17792, 17802, 17804, 17809, 17811, 17812, 17813, 17822, 17825, 17830, 17840, 17850, 17853, 17854, 17893, 17900

METAL FABRICATING AND FINISHING
17066, 17077, 17079, 17081, 17110, 17139, 17142, 17146, 17172, 17174, 17227, 17337, 17343, 17413, 17514, 17737

METAL POISONING
17047, 17142, 17700, 17703, 17704, 17707, 17709, 17717, 17718, 17719, 17720, 17721, 17732, 17741, 17746, 17756, 17757, 17765, 17768, 17772, 17781, 17785, 17786, 17792, 17818, 17853, 17900

METALS
17030, 17036, 17040, 17066, 17075, 17077, 17079, 17081, 17115, 17146, 17160, 17178, 17180, 17183, 17189, 17190, 17198, 17212, 17213, 17219, 17221, 17227, 17236, 17266, 17315, 17329, 17333, 17337, 17343, 17375, 17376, 17401, 17413, 17431, 17501, 17537, 17559, 17672, 17673, 17755, 17772, 17819, 17820, 17821, 17822, 17827, 17828, 17865, 17868, 17889

METEOROLOGICAL INSTRUMENTS
17454, 17457, 17588, 17589, 17593, 17614, 17621, 17631

METEOROLOGY
17042, 17046, 17069, 17072, 17083, 17097, 17104, 17108, 17109, 17110, 17111, 17112, 17116, 17136, 17140, 17146, 17149, 17191, 17202, 17260, 17264, 17265, 17279, 17312, 17359, 17360, 17393, 17402, 17416, 17420, 17438, 17454, 17458, 17486, 17497, 17517, 17533, 17535, 17538, 17540, 17543, 17545, 17547, 17549, 17550, 17551, 17553, 17562, 17564, 17565, 17567, 17569, 17571, 17574, 17575, 17577, 17578, 17579, 17580, 17581, 17582, 17583, 17584, 17585, 17586, 17587, 17589, 17590, 17591, 17593, 17594, 17595, 17596 17597, 17598, 17599, 17600, 17601, 17603, 17604, 17606, 17607, 17608, 17609, 17610, 17612, 17613, 17614, 17616, 17618, 17620, 17621, 17622, 17623, 17624, 17625, 17626, 17627, 17634, 17635, 17636, 17638, 17639, 17640, 17642, 17643, 17644, 17645, 17646, 17648, 17649, 17652, 17653, 17656, 17658, 17659, 17660, 17661, 17662, 17663, 17664, 17666, 17673, 17675, 17727, 17762, 17793, 17812, 17817, 17818, 17819, 17821, 17823, 17825, 17827, 17834, 17857, 17865, 17872, 17876, 17882, 17883, 17885, 17891

METHANES
17069, 17118, 17201, 17323, 17374, 17462, 17479, 17615, 17649, 17683, 17685, 17818

MICHIGAN
17549, 17821

MICROMETEOROLOGY
17136, 17545, 17571, 17582, 17594, 17606, 17623, 17652, 17658, 17664, 17819, 17825

MICROORGANISMS
17083, 17117, 17131, 17414, 17454, 17545, 17678, 17700, 17730, 17799

MICROSCOPY
17498, 17603, 17618

MIDDLE ATMOSPHERE
17561

MINERAL PROCESSING
17037, 17056, 17077, 17080, 17139, 17146, 17193, 17227, 17333, 17368, 17384, 17385, 17404, 17421, 17482, 17543, 17546, 17559, 17659, 17672, 17673, 17712, 17722, 17778, 17788, 17802, 17805, 17842, 17889

MINING
17056, 17384, 17421, 17482, 17672, 17673, 17712, 17778, 17788, 17805

MISSOURI
17881, 17888

MISTS
17142, 17253, 17283, 17296, 17306, 17325, 17327, 17335, 17454, 17801, 17836

MOLYBDENUM COMPOUNDS
17159, 17194, 17294, 17300, 17301, 17354, 17390, 17432

MONITORING
17027, 17055, 17057, 17058, 17075, 17089, 17123, 17202, 17267, 17269, 17279, 17280, 17338, 17340, 17380, 17416, 17419, 17431, 17433, 17440, 17441, 17443, 17451, 17452, 17453, 17454, 17455, 17462, 17467, 17474, 17475, 17477, 17478, 17479, 17485, 17489, 17497, 17499, 17501, 17504, 17506, 17510, 17512, 17516, 17518, 17519, 17524, 17526, 17527, 17530, 17535, 17550, 17571, 17585, 17586, 17635, 17711, 17714, 17730, 17845, 17860, 17865, 17885

MONTHLY
17550, 17551, 17560, 17570, 17572, 17645, 17651, 17846

MORBIDITY
17673, 17713, 17733, 17734, 17735, 17753, 17766, 17774

MORTALITY
17109, 17703, 17720, 17723, 17727, 17733, 17742, 17751, 17765, 17766, 17770, 17771, 17780, 17840

MOTTLING
17801

MOUNTAINS
17579, 17664, 17809

MOUTH
17750

MULTIPLE CHAMBER INCINERATORS
17038, 17096, 17271, 17351

MUTATIONS
17525, 17728, 17782

N

NAPHTHALENES
17244, 17728

NATURAL GAS
17026, 17037, 17041, 17055, 17059, 17067, 17102, 17112, 17118, 17132, 17144, 17201, 17323, 17362, 17496, 17520, 17536, 17537, 17582, 17650, 17850, 17861, 17897

NAUSEA
17142, 17781

NEBRASKA
17075, 17136, 17803

NECROSIS
17793, 17798, 17803, 17814, 17815

NERVOUS SYSTEM
17047, 17142, 17435, 17701, 17703, 17710, 17714, 17717, 17719, 17725, 17729, 17732, 17737, 17740, 17756, 17765, 17772, 17791

NEUTRAL CONDITION
17656, 17657

NEUTRON ACTIVATION ANALYSIS
17448, 17508, 17522, 17525, 17560, 17562, 17755

NEVADA
17031

NEW JERSEY
17173

NEW MEXICO
17556, 17598, 17645

NEW ORLEANS
17821

NEW YORK CITY
17166, 17768

NEW YORK STATE
17166, 17768, 17857

NICKEL
17115

NICKEL COMPOUNDS
17197, 17213, 17273, 17293, 17551, 17559, 17560, 17700, 17765

NITRATES
17163, 17492, 17803, 17813, 17829

NITRATION
17135

NITRIC ACID
17060, 17181, 17198, 17249, 17341, 17374, 17668, 17677, 17842

NITRIC OXIDE (NO)
17050, 17064, 17083, 17142, 17145, 17150, 17197, 17289, 17328, 17341, 17423, 17458, 17506, 17526, 17538, 17544, 17610, 17611, 17648, 17649, 17668, 17669, 17683, 17693, 17801, 17821, 17854, 17865

NITROGEN
17063, 17083, 17131, 17198, 17486, 17647, 17649, 17683, 17690, 17800, 17805, 17813

NITROGEN DIOXIDE (NO2)
17044, 17142, 17289, 17341, 17363, 17424, 17441, 17458, 17475, 17519, 17526, 17538, 17544, 17581, 17610, 17617, 17648, 17668, 17669, 17694, 17730, 17801, 17803, 17815, 17821, 17837, 17846, 17865

NITROGEN OXIDES
17026, 17037, 17039, 17043, 17044, 17045, 17050, 17053, 17055, 17059, 17064, 17075, 17076, 17083, 17109, 17118, 17119, 17123, 17125, 17128, 17132, 17142, 17144, 17145, 17150, 17152, 17169, 17178, 17197, 17204, 17234, 17237, 17249, 17252, 17254, 17263, 17270, 17271, 17280, 17289, 17304, 17311, 17321, 17326, 17328, 17341, 17363, 17384, 17415, 17416, 17423, 17424, 17441, 17443, 17445, 17454, 17458, 17475, 17479, 17506, 17519, 17526, 17536, 17537, 17538, 17539, 17544, 17552, 17572, 17574, 17581, 17590, 17600, 17602, 17610, 17611, 17617, 17648, 17649, 17650, 17662, 17668, 17669, 17677, 17683, 17693, 17694, 17730, 17782, 17787, 17801, 17803, 17813, 17815, 17818, 17821, 17829, 17837, 17841, 17842, 17843, 17846, 17854, 17865, 17893

NON-INDUSTRIAL EMISSION SOURCES
17026, 17027, 17029, 17032, 17034, 17035, 17037, 17038, 17048, 17049, 17052, 17055, 17056, 17058, 17059, 17062, 17063, 17069, 17075, 17080, 17083, 17096, 17097, 17099, 17106, 17111, 17116, 17117, 17130, 17131, 17135, 17137, 17139, 17140, 17144, 17146, 17150, 17173, 17179, 17187, 17192, 17201, 17213, 17214, 17225, 17235, 17247, 17250,

17267, 17271, 17298, 17310, 17318, 17320,
17329, 17332, 17336, 17338, 17340, 17342,
17343, 17356, 17382, 17434, 17436, 17443,
17448, 17454, 17479, 17525, 17527, 17536,
17537, 17539, 17556, 17563, 17570, 17571,
17584, 17587, 17597, 17650, 17657, 17658,
17672, 17673, 17678, 17713, 17726, 17728,
17740, 17784, 17805, 17811, 17818, 17833,
17834, 17849, 17850, 17855, 17856, 17859,
17866, 17867, 17868, 17871, 17875, 17887,
17889, 17891, 17893

NON-URBAN AREAS
17069, 17094, 17104, 17105, 17540, 17542,
17544, 17545, 17550, 17551, 17566, 17570,
17606, 17623, 17644, 17645, 17699, 17735,
17742, 17748, 17750, 17751, 17765, 17766,
17770, 17771, 17783, 17785, 17821, 17875

NOSTRILS
17142, 17684

NUCLEAR EXPLOSIONS
17048, 17637

NUCLEAR POWER PLANTS
17088, 17102, 17112, 17144, 17279, 17586,
17861

NUCLEAR POWER SOURCES
17088, 17140

NUCLEATION
17109, 17545, 17580, 17618, 17622, 17645,
17646

NUCLEIC ACIDS
17777

NYLON
17519

O

OATS
17815

OCEANS
17097, 17565, 17567, 17593, 17618, 17620,
17633, 17663

OCTANES
17078, 17086, 17155, 17264, 17371, 17389

ODOR COUNTERACTION
17068, 17069, 17096, 17131, 17149, 17179,
17238, 17260, 17270, 17271, 17290, 17302,
17307, 17310, 17320, 17324, 17342, 17375,
17384, 17393, 17877

ODORIMETRY
17238, 17310, 17393, 17418, 17433, 17436,
17454, 17460, 17468, 17473, 17493, 17521,
17684, 17729, 17854, 17877

ODORS
17042, 17069, 17084, 17116, 17117, 17128,
17142, 17149, 17179, 17238, 17270, 17271,
17328, 17340, 17342, 17364, 17375, 17393,
17408, 17418, 17436, 17454, 17460, 17468,
17473, 17493, 17521, 17539, 17684, 17702,
17846, 17854, 17869, 17877

OHIO
17751, 17821, 17881

OIL BURNERS
17029, 17065, 17080, 17096, 17130, 17140,
17173, 17206, 17226, 17304, 17332, 17336

OIL RESOURCES
17088, 17106, 17112, 17140, 17301, 17340,
17894, 17897

OLEFINS
17073, 17101, 17110, 17142, 17147, 17155,
17371, 17480, 17488, 17489, 17491, 17611,
17649, 17685, 17694, 17711, 17789, 17803

OPEN BURNING
17037, 17049, 17052, 17069, 17116, 17146,
17150, 17214, 17443, 17454, 17536, 17537,
17584, 17587, 17597, 17658, 17678, 17713,
17805, 17834

OPERATING CRITERIA
17076, 17204, 17267, 17279, 17417

OPERATING VARIABLES
17026, 17033, 17036, 17039, 17052, 17058,
17064, 17065, 17068, 17072, 17077, 17078,
17082, 17086, 17089, 17090, 17092, 17098,
17100, 17103, 17108, 17114, 17118, 17120,
17124, 17129, 17132, 17134, 17141, 17145,
17149, 17152, 17158, 17178, 17180, 17190,
17191, 17194, 17196, 17197, 17200, 17203,
17208, 17213, 17220, 17222, 17224, 17227,
17229, 17239, 17242, 17251, 17254, 17255,
17258, 17265, 17270, 17272, 17286, 17293,
17295, 17297, 17301, 17304, 17305, 17312,
17318, 17319, 17322, 17328, 17329, 17332,
17333, 17336, 17338, 17341, 17344, 17346,
17361, 17364, 17365, 17371, 17374, 17379,
17386, 17387, 17388, 17390, 17410, 17427,
17428, 17429, 17438, 17439, 17454, 17523,
17543, 17596, 17631, 17636, 17666, 17675,
17711

OPINION SURVEYS
17759, 17901

ORCHARDS
17794

OREGON
17584, 17658, 17834, 17901

ORGANIC ACIDS
17083, 17216, 17255, 17267, 17436, 17454,
17475, 17500, 17539, 17704, 17780

ORGANIC NITROGEN COMPOUNDS
17063, 17083, 17135, 17201, 17342, 17436,
17491, 17500, 17667, 17720

ORGANIC PHOSPHORUS COMPOUNDS
17099, 17468, 17512

ORGANIC SULFUR COMPOUNDS
17201, 17221, 17320, 17324, 17342, 17390,
17433, 17436, 17437, 17453, 17454, 17488,
17520, 17524, 17709, 17754

ORGANIC WASTES
17063, 17069, 17131, 17179, 17235, 17310,
17320, 17342, 17343, 17436, 17527, 17818,
17875

ORGANOMETALLICS
17434

ORSAT ANALYSIS
17454, 17544

OUTPATIENT VISITS
17753, 17774

OVERFIRE AIR
17364

OXIDANTS
17042, 17075, 17416, 17452, 17479, 17526,
17538, 17573, 17600, 17602, 17662, 17782,
17801, 17821, 17823, 17837, 17857, 17865

OXIDATION
17065, 17104, 17141, 17163, 17167, 17192,
17209, 17226, 17262, 17263, 17266, 17284,
17289, 17326, 17337, 17349, 17363, 17365,
17432, 17458, 17461, 17467, 17468, 17592,
17650, 17754, 17767

OXYGEN
17065, 17083, 17089, 17108, 17110, 17130,
17150, 17265, 17286, 17355, 17401, 17486,
17597, 17615, 17617, 17647, 17649, 17654,
17668, 17677, 17680, 17683, 17685, 17690,
17799, 17801

OXYGENATED FRACTIONS
17415

OZONE
17075, 17083, 17110, 17142, 17270, 17289,
17488, 17489, 17491, 17506, 17574, 17581,
17600, 17610, 17611, 17621, 17649, 17668,
17680, 17729, 17754, 17758, 17790, 17794,
17798, 17803, 17808, 17816, 17829, 17837

OZONESONDES
17621

P

PACKED TOWERS
17167, 17171, 17196, 17219, 17238, 17277,
17361

PAINT MANUFACTURING
17142, 17320

PAINTS
17174, 17296, 17362, 17732, 17785, 17853,
17900

PAPER CHROMATOGRAPHY
17149, 17436, 17494, 17531

PAPER MANUFACTURING
17060, 17123, 17146, 17149, 17177, 17232,
17249, 17325, 17333, 17453, 17454, 17867

PARIS
17029, 17599

PARTICLE COUNTERS
17269, 17427, 17428, 17429, 17457, 17466,
17513, 17578, 17618, 17645, 17666, 17699

PARTICLE GROWTH
17233, 17318, 17383, 17386, 17596, 17606,
17622, 17645

PARTICLE SHAPE
17146, 17439, 17446, 17529, 17597, 17660,
17687

PARTICLE SIZE
17077, 17105, 17115, 17146, 17170, 17193,
17222, 17229, 17236, 17242, 17269, 17285,
17290, 17306, 17315, 17319, 17333, 17339,
17351, 17367, 17383, 17386, 17395, 17414,
17421, 17422, 17430, 17438, 17439, 17442,
17446, 17454, 17457, 17466, 17483, 17492
17505, 17513, 17517, 17529, 17541, 17545,
17549, 17550, 17554, 17567, 17572, 17581,
17593, 17597, 17603, 17606, 17618, 17645,
17654, 17655, 17659, 17660, 17674, 17682,
17686, 17687, 17692, 177[illegible]9, 17835, 17903

PARTICULATE SAMPLING
17136, 17422, 17430, 17443, 17454, 17483,
17495, 17501, 17517, 17535, 17606

PATHOLOGICAL TECHNIQUES
17701, 17714, 17730, 17736, 17743, 17744,
17755, 17761, 17779, 17880

PENELEC (CONTACT PROCESS)
17192, 17410, 17828

PENNSYLVANIA
17116, 17173, 17280, 17821, 17833

PENTANES
17714

PERMEABILITY
17239, 17272, 17359, 17705

PERMITS
17157, 17867, 17869

PEROXIDES
17083, 17113, 17574, 17592, 17675

PEROXYACETYL NITRATE
17803, 17829

PEROXYACYL NITRATES
17803, 17829

PERSONNEL
17158, 17421, 17476 17527, 17535, 17713, 17734, 17759, 17762, 17776, 17850, 17855, 17880, 17882, 17895, 17896

PERSONNEL QUALIFICATIONS
17889

PERYLENES
17654

PESTICIDES
17027, 17048, 17069, 17099, 17235, 17434, 17468, 17479, 17525, 17567, 17570, 17571, 17728, 17740, 17783

PETER SPENCE PROCESS (CLAUS)
17159, 17194, 17224

PETROLEUM DISTRIBUTION
17032, 17331, 17718

PETROLEUM PRODUCTION
17075, 17091, 17122, 17265, 17410, 17563

PETROLEUM REFINING
17062, 17063, 17075, 17146, 17147, 17218, 17243, 17264, 17303, 17320, 17340, 17374, 17389, 17502, 17537, 17558, 17573, 17711, 17830

PH
17145, 17325, 17548, 17554, 17670, 17822

PHENOLS
17039, 17070, 17086, 17342

PHENYL COMPOUNDS
17711

PHILADELPHIA
17821, 17833

PHOSPHORIC ACID
17192, 17396, 17422

PHOSPHORUS COMPOUNDS
17040, 17058, 17181, 17192, 17432, 17510, 17743, 17807, 17809

PHOTOCHEMICAL REACTIONS
17070, 17073, 17110, 17157, 17263, 17489, 17574, 17592, 17600, 17602, 17610, 17611, 17615, 17617, 17621, 17649, 17650, 17654, 17662, 17668, 17821, 17837, 17893

PHOTOELECTRIC PHENOMENA
17110, 17617, 17647, 17668, 17669, 17680, 17690

PHOTOGRAPHIC METHODS
17513, 17618

PHOTOIONIZATION
17617, 17647, 17668

PHOTOLYSIS
17615, 17617

PHOTOMETRIC METHODS
17101, 17123, 17235, 17395, 17419, 17424, 17440, 17471, 17473, 17480, 17486, 17487, 17500, 17504, 17509, 17510, 17524, 17645, 17691, 17760, 17860, 17878

PHOTOOXIDATION
17600, 17611, 17617, 17649, 17650, 17821

PHOTOSYNTHESIS
17110, 17547, 17790, 17801, 17809

PHYTOTOXICANTS
17793, 17803

PILOT PLANTS
17029, 17092, 17168, 17171, 17180, 17219, 17224, 17265, 17283, 17289, 17344, 17357, 17361, 17369

PINTO BEANS
17815

PITTSBURGH
17116

PLAINS
17136

PLANNING AND ZONING
17031, 17062, 17106, 17136, 17218, 17280, 17340, 17575, 17576, 17801, 17833, 17847, 17866, 17870, 17872, 17876, 17882, 17883, 17888, 17889, 17894, 17898, 17899

PLANT DAMAGE
17034, 17035, 17042, 17083, 17149, 17314, 17539, 17548, 17582, 17702, 17787, 17788, 17789, 17790, 17793, 17794, 17798, 17800, 17801, 17802, 17803, 17805, 17806, 17807, 17808, 17809, 17811, 17813, 17814, 17815, 17816, 17829, 17879

PLANT GROWTH
17110, 17214, 17547, 17790, 17793, 17795, 17797, 17801, 17806, 17807, 17809, 17816

PLANT INDICATORS
17794, 17804, 17817

PLASTICS
17075, 17100, 17101, 17189, 17205, 17207, 17210, 17215, 17228, 17247, 17260, 17267, 17780

PLATINUM
17183, 17198, 17343

PLEURISY
17762

PLUME BEHAVIOR
17191, 17543, 17575, 17586, 17588, 17589, 17598, 17604, 17607, 17625, 17627, 17629, 17635, 17636, 17639, 17652, 17657

PNEUMOCONIOSIS
17421, 17422, 17501, 17705, 17715, 17722, 17747, 17779

PNEUMONIA
17142, 17723, 17733, 17762

POINT SOURCES
17037, 17576, 17583, 17629, 17632, 17663

POLAROGRAPHIC METHODS
17454

POLLENS
17069, 17083

POLYMERIZATION
17215, 17309

POLYNUCLEAR COMPOUNDS
17039, 17053, 17070, 17073, 17074, 17078, 17105, 17110, 17124, 17128, 17244, 17454, 17464, 17494, 17654, 17676, 17728, 17761, 17771, 17777, 17778, 17893

POTASSIUM COMPOUNDS
17161, 17242, 17348, 17560, 17746, 17813

POTATOES
17793

POTENTIOMETRIC METHODS
17437, 17443, 17449, 17454, 17504, 17515

POULTRY
17310

POWER SOURCES
17026, 17028, 17033, 17037, 17044, 17045, 17051, 17054, 17055, 17057, 17059, 17067, 17068, 17071, 17073, 17076, 17085, 17088, 17089, 17090, 17098, 17103, 17106, 17112, 17119, 17122, 17125, 17128, 17132, 17133, 17137, 17138, 17140, 17141, 17148, 17151, 17158, 17166, 17169, 17176, 17178, 17202, 17225, 17234, 17245, 17246, 17248, 17259, 17276, 17281, 17313, 17317, 17321, 17322, 17326, 17328, 17353, 17367, 17374, 17379, 17384, 17397, 17398, 17403, 17406, 17407, 17415, 17440, 17474, 17506, 17532, 17536, 17537, 17772, 17782, 17850, 17854, 17856, 17889, 17904

PRECIPITATION
17097, 17104, 17109, 17110, 17136, 17551, 17584, 17594, 17596, 17599, 17601, 17607, 17623, 17624, 17642, 17645, 17646, 17652, 17653, 17659, 17661, 17673, 17821, 17825, 17865

PRESSURE (ATMOSPHERIC)
17538, 17578, 17621, 17622, 17648, 17661, 17727

PRIMARY METALLURGICAL PROCESSING
17030, 17036, 17040, 17066, 17075, 17082, 17113, 17115, 17146, 17160, 17180, 17212, 17213, 17219, 17221, 17236, 17266, 17315, 17329, 17333, 17368, 17372, 17394, 17401, 17454, 17501, 17531, 17537, 17772, 17802, 17805, 17828, 17863, 17868, 17889

PRIMATES
17730, 17764

PRINTING
17343

PROCESS MODIFICATION
17029, 17060, 17065, 17071, 17080, 17081, 17091, 17098, 17108, 17120, 17129, 17134, 17137, 17141, 17145, 17150, 17162, 17163, 17179, 17202, 17214, 17226, 17227, 17234, 17235, 17238, 17245, 17246, 17248, 17250, 17252, 17254, 17267, 17271, 17304, 17317, 17322, 17324, 17326, 17328, 17332, 17337, 17362, 17364, 17372, 17379, 17384, 17403, 17543, 17741, 17842

PROPANES
17118, 17313, 17649, 17685

PROPENES
17611, 17649, 17711

PROPOSALS
17854, 17862

PROTECTIVE MASKS
17081, 17306

PROTEINS
17047, 17464, 17709, 17721, 17724, 17745, 17750

PUBLIC AFFAIRS
17158, 17535, 17759, 17776, 17848, 17852, 17855, 17884, 17891, 17901, 17903

PUBLIC INFORMATION
17776, 17848, 17884

PULMONARY EDEMA
17110, 17730

PULMONARY FUNCTION
17699, 17731, 17738, 17747, 17748, 17769, 17774

PULVERIZED FUELS
17108, 17211, 17223

PYRENES
17039, 17074, 17078, 17105, 17110, 17464, 17654, 17676, 17771, 17777, 17778

PYRIDINES
17342

PYROLYSIS
17072, 17265, 17364

Q

QUARTZ
17422, 17687, 17764

QUENCHING
17649

QUESTIONNAIRES
17037, 17536, 17537, 17699, 17738, 17759, 17773, 17830, 17834

R

RABBITS
17709, 17710, 17746, 17764

RADIATION MEASURING SYSTEMS
17448, 17454, 17470, 17525, 17628, 17631

RADIOACTIVE RADIATION
17032, 17102, 17182, 17222, 17231, 17235, 17279, 17354, 17434, 17442, 17448, 17454, 17465, 17469, 17470, 17472, 17479, 17492, 17504, 17525, 17556, 17560, 17586, 17589, 17635, 17712, 17724, 17824, 17835, 17856

RADIOACTIVE TRACERS
17231, 17434, 17448, 17504, 17525, 17635, 17712, 17724

RADIOGRAPHY
17773, 17781

RADIOSONDES
17588, 17589, 17621

RAIN
17097, 17109, 17136, 17551, 17584, 17594, 17599, 17601, 17607, 17623, 17645, 17646, 17673, 17825

RAPPING
17191

RATS
17704, 17709, 17714, 17724, 17729, 17736, 17743, 17758, 17761, 17764, 17777, 17780, 17786

REACTION KINETICS
17050, 17113, 17145, 17190, 17224, 17226, 17286, 17301, 17305, 17336, 17357, 17365, 17410, 17461, 17500, 17592, 17597, 17610, 17611, 17649, 17671, 17688, 17693, 17694

REACTION MECHANISMS
17050, 17145, 17163, 17224, 17226, 17254, 17286, 17305, 17348, 17349, 17357, 17390, 17458, 17592, 17597, 17600, 17610, 17611, 17615, 17649, 17675, 17676, 17677, 17683, 17688, 17693, 17694, 17700, 17754, 17758

REACTORS (NUCLEAR)
17088, 17586

RECOMBINATION
17615

RECORDING METHODS
17513, 17618

REDUCTION
17197, 17209, 17263, 17326, 17349, 17365, 17412, 17432, 17461, 17693, 17754

REFRACTIVE INDEX
17619

REGIONAL GOVERNMENTS
17037, 17380, 17539, 17859 17885, 17888

REGULATIONS
17058, 17106, 17115, 17173, 17189, 17204, 17332, 17408, 17478, 17830, 17833, 17842, 17843, 17848, 17863, 17867, 17870, 17879, 17889, 17895, 17897, 17898

REINLUFT PROCESS (ADSORPTION)
17102

RENDERING
17320, 17375

REPRODUCTION
17703, 17728, 17765, 17791, 17810

RESEARCH INSTITUTES
17501, 17556, 17589, 17854, 17879, 17884

RESEARCH METHODOLOGIES
17133, 17425, 17452, 17468, 17501, 17525, 17608, 17731, 17738, 17749, 17758, 17775, 17811, 17864

RESEARCH PROGRAMS
17042, 17049, 17077, 17121, 17154, 17311, 17369, 17425, 17535, 17614, 17775, 17841, 17850, 17853, 17854, 17864, 17867, 17868, 17871, 17880, 17894, 17897, 17899, 17904

RESIDENTIAL AREAS
17037, 17055, 17094, 17550, 17559, 17570, 17576, 17598, 17605, 17699, 17753, 17876, 17900

RESIDUAL OILS
17106, 17154, 17206, 17272, 17273, 17274, 17293, 17294, 17300, 17301, 17304, 17334, 17340, 17363, 17537, 17564, 17889

RESPIRATION
17547, 17801, 17809

RESPIRATORY DISEASES
17081, 17110, 17126, 17142, 17421, 17422, 17501, 17572, 17699, 17702, 17705, 17713, 17715, 17722, 17723, 17726, 17730, 17733, 17734, 17736, 17738, 17743, 17747, 17748, 17753, 17759, 17760, 17762, 17766, 17769, 17773, 17774, 17776, 17779, 17781, 17818, 17846, 17857

RESPIRATORY SYSTEM
17126, 17142, 17430, 17464, 17572, 17684, 17702, 17705, 17711, 17713, 17724, 17725, 17729, 17730, 17736, 17743, 17744, 17747, 17755, 17758, 17761, 17764, 17777, 17778, 17781, 17835, 17846

RETENTION
17047, 17716, 17719, 17728, 17757, 17772, 17785, 17792, 17796, 17802, 17804

RINGELMANN CHART
17026, 17115, 17235, 17869, 17873

RIVERS
17056, 17135, 17571, 17672, 17673, 17784

ROTARY PISTON ENGINES
17045, 17169, 17506

RUBBER
17075, 17096, 17126, 17464

RUBBER MANUFACTURING
17075, 17537

S

SAFETY EQUIPMENT
17081, 17202, 17232, 17282, 17306, 17326, 17410, 17711, 17863

SAMPLERS
17057, 17136, 17215, 17229, 17242, 17414, 17415, 17421, 17430, 17437, 17438, 17439, 17443, 17454, 17455, 17466, 17479, 17482, 17492, 17499, 17501, 17511, 17514, 17517, 17523, 17535, 17541, 17543, 17549, 17550, 17560, 17562, 17570, 17593, 17603, 17606, 17618, 17630, 17645, 17686, 17699, 17706, 17835

SAMPLING PROBES
17415, 17454, 17484, 17486, 17496

SAN FRANCISCO
17116, 17590, 17738, 17621

SANITARIANS
17850

SCATTERING (ATMOSPHERIC)
17565, 17581, 17612, 17628, 17638, 17641, 17643, 17647, 17675

SCREEN FILTERS
17210, 17260, 17376, 17570

SCRUBBERS
17038, 17058, 17068, 17077, 17080, 17102, 17115, 17146, 17160, 17165, 17167, 17170, 17171, 17172, 17179, 17185, 17186, 17187, 17188, 17189, 17191, 17196, 17199, 17201, 17211, 17212, 17216, 17218, 17219, 17220, 17221, 17228, 17229, 17235, 17236, 17238, 17242, 17243, 17244, 17249, 17254, 17258, 17261, 17262, 17269, 17277, 17280, 17283, 17285, 17290, 17295, 17296, 17298, 17302, 17303, 17315, 17318, 17319, 17320, 17324, 17325, 17327, 17329, 17336, 17344, 17345, 17352, 17361, 17366, 17368, 17369, 17381, 17386, 17388, 17392, 17394, 17396, 17404, 17410, 17413, 17424, 17440, 17451, 17523, 17543, 17546, 17831

SEA BREEZE
17876

SEA SALTS
17824, 17825

SEALING COMPOUNDS
17142, 17240

SECONDARY AIR
17150, 17245, 17246, 17252, 17322

SEDIMENTATION
17137, 17165, 17195, 17208, 17260, 17266, 17269, 17392, 17411, 17413, 17438, 17439, 17492, 17513, 17566, 17606, 17633, 17659, 17666

SELENIUM COMPOUNDS
17592

SETTLING CHAMBERS
17136, 17269, 17689

SETTLING PARTICLES
17038, 17043, 17046, 17065, 17069, 17075, 17077, 17080, 17081, 17083, 17098, 17107, 17109, 17110, 17113, 17123, 17136, 17162, 17164, 17165, 17172, 17179, 17180, 17186, 17187, 17188, 17191, 17193, 17195, 17206, 17211, 17216, 17221, 17223, 17227, 17231, 17236, 17256, 17260, 17266, 17267, 17269, 17271, 17275, 17278, 17279, 17280, 17283, 17287, 17295, 17297, 17299, 17304, 17315, 17318, 17319, 17324, 17325, 17330, 17332, 17333, 17336, 17338, 17351, 17359, 17361, 17368, 17373, 17382, 17383, 17385, 17392, 17400, 17404, 17408, 17409, 17411, 17413, 17416, 17421, 17427, 17428, 17429, 17439, 17450, 17455, 17464, 17469, 17482, 17483, 17495, 17496, 17499, 17500, 17501, 17523, 17532, 17535, 17539, 17540, 17546, 17551, 17555, 17560, 17561, 17567, 17572, 17576, 17577, 17578, 17579, 17593, 17594, 17603, 17626, 17633, 17638, 17643, 17648, 17650,

17659, 17666, 17689, 17691, 17715, 17724, 17741, 17743, 17764, 17778, 17779, 17781, 17785, 17787, 17801, 17809, 17824, 17825, 17826, 17835, 17838, 17846, 17847, 17854, 17856, 17863, 17865, 17868, 17893, 17895

SEWAGE
17032, 17038, 17080, 17187, 17201, 17318, 17448

SEWAGE TREATMENT
17448

SEWERS
17032

SHEEP
17785, 17791

SHIPS
17037, 17067, 17537, 17856, 17869

SIEVE ANALYSIS
17513

SILICATES
17052, 17129, 17384

SILICON COMPOUNDS
17052, 17081, 17129, 17215, 17300, 17308, 17384, 17508, 17551, 17764, 17811

SILICON DIOXIDE
17551, 17572, 17705

SILICOSIS
17422, 17501, 17705, 17779

SILVER COMPOUNDS
17560

SIMULATION
17046, 17058, 17163, 17203, 17305, 17339, 17430, 17468, 17601, 17606, 17608, 17611, 17632, 17636, 17647, 17683, 17830, 17854, 17865

SINTERING
17329

SINUSES
17744

SKIN
17047, 17142, 17728, 17750, 17765, 17835

SLAUGHTERHOUSES
17875

SLUDGE
17038, 17080, 17187, 17318

SMOG
17110, 17116, 17263, 17367, 17391, 17480, 17533, 17574, 17592, 17594, 17602, 17610, 17611, 17617, 17634, 17662, 17710, 17766, 17782, 17787, 17876, 17887

SMOKE SHADE
17026, 17115, 17130, 17235, 17440, 17499, 17509, 17532, 17842, 17869, 17873

SMOKEMETERS
17057, 17101, 17128, 17415, 17440, 17496, 17509, 17532

SMOKES
17049, 17052, 17055, 17061, 17069, 17075, 17077, 17096, 17098, 17101, 17107, 17111, 17115, 17116, 17173, 17179, 17198, 17199, 17214, 17254, 17267, 17271, 17281, 17290, 17303, 17315, 17336, 17364, 17373, 17410, 17415, 17417, 17509, 17532, 17534, 17569, 17580, 17583, 17584, 17587, 17616, 17629, 17636, 17638, 17654, 17658, 17665, 17675, 17686, 17713, 17764, 17771, 17795, 17797, 17801, 17805, 17809, 17818, 17834, 17847, 17869, 17879, 17887

SMOKING
17074, 17105, 17733, 17738, 17749, 17766, 17769, 17771, 17783

SNOW
17104, 17596, 17607

SOCIAL ATTITUDES
17043, 17848, 17897

SOCIO-ECONOMIC FACTORS
17031, 17034, 17102, 17106, 17112, 17122, 17138, 17139, 17140, 17147, 17149, 17155, 17213, 17225, 17254, 17264, 17269, 17644, 17723, 17751, 17766, 17783, 17828, 17830, 17832, 17833, 17834, 17837, 17848, 17852, 17861, 17862, 17864, 17866, 17872, 17879, 17891, 17894, 17897, 17898, 17900, 17902

SODIUM CARBONATE
17194, 17233, 17262, 17325, 17363, 17366, 17482, 17597

SODIUM CHLORIDE
17231, 17348, 17444, 17541

SODIUM COMPOUNDS
17068, 17161, 17177, 17194, 17224, 17226, 17231, 17233, 17242, 17255, 17262, 17325, 17348, 17363, 17366, 17369, 17384, 17388, 17410, 17444, 17482, 17541, 17560, 17597, 17675, 17719, 17720, 17811

SODIUM HYDROXIDE
17177, 17366, 17597

SODIUM SULFITE
17068, 17177, 17325, 17384, 17388, 17410

SOILING
17028, 17146, 17824

SOILING INDEX
17127, 17258, 17409, 17556

SOILS
17069, 17094, 17095, 17099, 17136, 17360, 17545, 17556, 17571, 17784, 17788, 17812, 17817, 17824

SOLAR RADIATION
17088, 17109, 17110, 17140, 17497, 17579, 17581, 17594, 17599, 17600, 17610, 17628, 17631, 17641, 17643, 17647, 17649, 17793, 17865

SOLID WASTE DISPOSAL
17027, 17032, 17037, 17058, 17062, 17063, 17069, 17096, 17116, 17117, 17130, 17131, 17137, 17139, 17144, 17179, 17192, 17201, 17213, 17225, 17235, 17250, 17267, 17271, 17310, 17320, 17329, 17342, 17343, 17382, 17436, 17527, 17563, 17657, 17672, 17818, 17833, 17850, 17868, 17875, 17889, 17893

SOLIDS
17129, 17233, 17459, 17592, 17633

SOLVENTS
17037, 17130, 17142, 17159, 17284, 17343, 17362, 17396, 17536, 17537, 17667

SOOT
17043, 17046, 17065, 17075, 17083, 17098, 17107, 17165, 17179, 17206, 17267, 17271, 17304, 17315, 17332, 17336, 17408, 17416, 17461, 17496, 17532, 17572, 17594, 17650, 17691, 17847

SOURCE SAMPLING
17053, 17229, 17446, 17453, 17454, 17475, 17484, 17496, 17499, 17502, 17505, 17523, 17530, 17535, 17541, 17546, 17686, 17842

SOUTH CAROLINA
17037

SOYBEANS
17798

SO2 REMOVAL (COMBUSTION PRODUCTS)
17060, 17082, 17102, 17106, 17107, 17123, 17156, 17159, 17161, 17163, 17165, 17167, 17168, 17177, 17181, 17190, 17191, 17192, 17194, 17199, 17207, 17209, 17213, 17219, 17221, 17224, 17233, 17234, 17265, 17270, 17277, 17279, 17283, 17286, 17291, 17298, 17305, 17309, 17312, 17314, 17324, 17325, 17329, 17336, 17337, 17340, 17344, 17345, 17348, 17352, 17355, 17357, 17360, 17361, 17363, 17366, 17369, 17372, 17377, 17381, 17388, 17410, 17413, 17667, 17725, 17828, 17832, 17836

SPACECRAFT ATMOSPHERES
17474

SPARK IGNITION ENGINES
17076, 17089, 17125, 17141, 17328, 17353

SPARK TIMING
17039, 17064, 17118, 17125, 17204, 17252, 17276, 17328, 17379

SPECTROMETRY
17124, 17128, 17182, 17184, 17235, 17309, 17354, 17355, 17415, 17419, 17431, 17442, 17443, 17445, 17447, 17450, 17453, 17454, 17459, 17472, 17474, 17478, 17479, 17480, 17488, 17489, 17490, 17492, 17504, 17508, 17510, 17512, 17522, 17526, 17530, 17547, 17550, 17560, 17562, 17669, 17680, 17687, 17698, 17790, 17824

SPECTROPHOTOMETRY
17104, 17143, 17426, 17437, 17453, 17454, 17458, 17502, 17503, 17504, 17510, 17520, 17558, 17649, 17729

SPORES
17545

SPOT TESTS
17414

SPRAY TOWERS
17186, 17187, 17188, 17212, 17290, 17303, 17318, 17366, 17368

SPRAYS
17318

ST LOUIS
17881, 17888

STABILITY (ATMOSPHERIC)
17270, 17533, 17572, 17580, 17584, 17585, 17586, 17588, 17589, 17590, 17594, 17595, 17596, 17601, 17604, 17605, 17613, 17623, 17625, 17634, 17635, 17640, 17656, 17657, 17659, 17663, 17727, 17834

STACK GASES
17026, 17032, 17046, 17048, 17053, 17055, 17058, 17080, 17082, 17084, 17091, 17093, 17108, 17144, 17146, 17156, 17159, 17161, 17163, 17164, 17165, 17167, 17168, 17172, 17174, 17177, 17179, 17180, 17181, 17185, 17186, 17187, 17188, 17189, 17191, 17194, 17199, 17202, 17206, 17213, 17219, 17224, 17229, 17233, 17249, 17250, 17254, 17255, 17265, 17271, 17277, 17283, 17286, 17290, 17295, 17298, 17305, 17312, 17324, 17325, 17329, 17335, 17336, 17337, 17340, 17347, 17352, 17355, 17357, 17361, 17363, 17368, 17369, 17372, 17388, 17393, 17394, 17396, 17399, 17402, 17410, 17416, 17454, 17475, 17486, 17502, 17523, 17534, 17535, 17541, 17546, 17576, 17586, 17598, 17607, 17627, 17629, 17636, 17657, 17661, 17663, 17828, 17831, 17842, 17850, 17854, 17863, 17867, 17868, 17871, 17879

STACK SAMPLING
17053, 17229, 17446, 17454, 17475, 17484, 17502, 17523, 17530, 17535, 17541, 17546, 17842

STACKS
17046, 17055, 17057, 17084, 17091, 17100, 17107, 17117, 17144, 17175, 17193, 17202, 17238, 17254, 17279, 17280, 17298, 17315, 17340, 17402, 17405, 17446, 17454, 17534, 17539, 17541, 17543, 17557, 17575, 17586, 17607, 17636, 17652, 17663, 17831, 17879, 17889

STAGNATION
17594, 17605

STATE GOVERNMENTS
17263, 17280, 17420, 17703, 17828, 17848, 17859, 17860, 17869, 17885, 17889, 17890, 17896, 17897

STATISTICAL ANALYSES
17107, 17208, 17460, 17550, 17551, 17559, 17581, 17583, 17586, 17601, 17616, 17623, 17628, 17641, 17651, 17655, 17675, 17687, 17723, 17727, 17733, 17734, 17735, 17737, 17742, 17748, 17751, 17753, 17769, 17770, 17771, 17774, 17831, 17834, 17848

STEAM
17386, 17388, 17518

STEAM ENGINES
17044, 17051, 17140, 17158, 17166, 17328

STEAM PLANTS
17026, 17053, 17071, 17112, 17130, 17144, 17191, 17345, 17842, 17871, 17889

STEEL
17040, 17075, 17081, 17146, 17160, 17178, 17189, 17213, 17227, 17236, 17315, 17329, 17333, 17375, 17401, 17501, 17537, 17820, 17821, 17822, 17827, 17868

STIPPLING
17803, 17815

STONE
17095, 17146, 17385, 17819

STORAGE BATTERIES
17033, 17057, 17059, 17085, 17090, 17772, 17854

STRATIFIED CHARGE ENGINES
17045

STREETS
17032, 17047, 17061, 17109, 17110, 17350, 17605, 17865, 17883

STUDENTS
17158, 17734

SULFATES
17104, 17181, 17190, 17209, 17226, 17265, 17309, 17336, 17345, 17360, 17426, 17492, 17551, 17552, 17554, 17559, 17637, 17645, 17802, 17824

SULFHYDRYL COMPOUNDS
17709, 17754

SULFIDES
17063, 17069, 17071, 17083, 17104, 17159, 17163, 17194, 17201, 17209, 17211, 17218, 17233, 17249, 17255, 17262, 17270, 17284, 17324, 17342, 17396, 17412, 17433, 17436, 17437, 17441, 17445, 17454, 17475, 17488, 17489, 17520, 17524, 17526, 17558, 17563, 17572, 17573, 17787, 17818, 17823, 17846, 17878

SULFITES
17068, 17163, 17181, 17309, 17336, 17355

SULFONIC ACID
17216

SULFUR COMPOUNDS
17037, 17059, 17060, 17063, 17068, 17069, 17071, 17077, 17083, 17104, 17115, 17133, 17154, 17159, 17163, 17181, 17190, 17194, 17201, 17202, 17209, 17211, 17218, 17226, 17233, 17249, 17255, 17262, 17264, 17265, 17266, 17270, 17284, 17301, 17309, 17314, 17324, 17336, 17342, 17345, 17355, 17360, 17372, 17396, 17412, 17426, 17433, 17436, 17437, 17441, 17445, 17448, 17449, 17453, 17454, 17473, 17475, 17488, 17489, 17492, 17510, 17520, 17524, 17526, 17528, 17548, 17551, 17552, 17554, 17558, 17559, 17563, 17572, 17573, 17637, 17645, 17787, 17802, 17818, 17823, 17824, 17828, 17846, 17868, 17878, 17889

SULFUR DIOXIDE
17026, 17036, 17037, 17043, 17046, 17053, 17055, 17058, 17065, 17075, 17080, 17083, 17103, 17104, 17107, 17108, 17109, 17110, 17111, 17115, 17181, 17185, 17189, 17192, 17202, 17209, 17211, 17221, 17233, 17235, 17236, 17265, 17270, 17280, 17283, 17332, 17336, 17337, 17346, 17360, 17409, 17410, 17412, 17416, 17424, 17437, 17441, 17445, 17473, 17475, 17479, 17486, 17491, 17502, 17518, 17524, 17526, 17534, 17536, 17542, 17551, 17552, 17554, 17564, 17572, 17573, 17576, 17581, 17582, 17605, 17607, 17608, 17632, 17637, 17648, 17649, 17650, 17652, 17662, 17663, 17665, 17667, 17671, 17680, 17685, 17713, 17734, 17744, 17748, 17749, 17793, 17794, 17795, 17796, 17801, 17802, 17803, 17808, 17809, 17814, 17815, 17816, 17819, 17820, 17821, 17823, 17827, 17836, 17842, 17845, 17846, 17847, 17857, 17860, 17865, 17878, 17879, 17887, 17893, 17894, 17897, 17903, 17905

SULFUR OXIDES
17026, 17029, 17036, 17037, 17043, 17046, 17053, 17055, 17058, 17065, 17075, 17080, 17083, 17103, 17104, 17107, 17108, 17109, 17110, 17111, 17115, 17181, 17185, 17189, 17191, 17192, 17202, 17209, 17211, 17221, 17233, 17234, 17235, 17236, 17243, 17254, 17265, 17270, 17280, 17283, 17304, 17315, 17332, 17336, 17337, 17345, 17346, 17360, 17388, 17409, 17410, 17412, 17416, 17424, 17437, 17441, 17445, 17453, 17454, 17473, 17475, 17479, 17486, 17489, 17491, 17502, 17518, 17524, 17526, 17534, 17535, 17536, 17537, 17539, 17542, 17548, 17551, 17552, 17554, 17557, 17564, 17572, 17573, 17576, 17581, 17582, 17590, 17605, 17607, 17608, 17632, 17637, 17648, 17649, 17650, 17652, 17662, 17663, 17665, 17667, 17671, 17680, 17685, 17699, 17713, 17734, 17744, 17748, 17749, 17787, 17793, 17794, 17795, 17796, 17801, 17802, 17803, 17808, 17809, 17814, 17815, 17816, 17819, 17820, 17821, 17823, 17827, 17836, 17842, 17845, 17846, 17847, 17851, 17857, 17858, 17860, 17865, 17878, 17879, 17887, 17893, 17894, 17897, 17903, 17905

SULFUR OXIDES CONTROL
17060, 17070, 17082, 17102, 17106, 17107, 17123, 17154, 17156, 17159, 17161, 17163, 17165, 17167, 17168, 17177, 17181, 17185, 17190, 17191, 17192, 17194, 17199, 17200, 17202, 17207, 17209, 17213, 17219, 17221, 17224, 17230, 17233, 17234, 17243, 17265, 17270, 17272, 17273, 17274, 17277, 17279, 17280, 17283, 17284, 17286, 17291, 17293, 17294, 17298, 17300, 17301, 17305, 17309, 17312, 17314, 17323, 17324, 17325, 17329, 17334, 17336, 17337, 17340, 17344, 17345, 17348, 17352, 17354, 17355, 17357, 17360, 17361, 17363, 17366, 17369, 17372, 17377, 17381, 17388, 17390, 17410, 17413, 17539, 17557, 17582, 17667, 17725, 17828, 17832, 17836, 17847, 17850, 17897

SULFUR TRIOXIDE
17029, 17065, 17075, 17083, 17107, 17108, 17110, 17185, 17189, 17192, 17233, 17243, 17265, 17283, 17304, 17332, 17346, 17388, 17410, 17518, 17548, 17552, 17846

SULFURIC ACID
17082, 17083, 17102, 17108, 17167, 17181, 17185, 17190, 17192, 17206, 17207, 17209, 17243, 17254, 17265, 17277, 17304, 17312, 17314, 17337, 17361, 17363, 17372, 17381, 17388, 17410, 17572, 17665, 17801, 17822, 17828, 17836, 17842

SUPERCOOLING
17665

SUPERSATURATION
17230, 17622

SURFACE COATING OPERATIONS
17142, 17174, 17236, 17296, 17343, 17362

SURFACE COATINGS
17142, 17174, 17296, 17343, 17362, 17732, 17741, 17785, 17826, 17853, 17900

SURFACE PROPERTIES
17030, 17066, 17182, 17184, 17226, 17272, 17273, 17294, 17348, 17359, 17360, 17373, 17376, 17390, 17565, 17592, 17656, 17812, 17822

SURFACTANTS
17485

SURVEY METHODS
17452, 17585, 17738, 17882

SUSPENDED PARTICULATES
17036, 17049, 17052, 17055, 17057, 17061, 17069, 17075, 17077, 17081, 17083, 17096, 17098, 17101, 17107, 17108, 17110, 17111, 17113, 17115, 17116, 17136, 17142, 17160, 17165, 17173, 17174, 17179, 17185, 17196, 17198, 17199, 17202, 17214, 17220, 17228, 17234, 17236, 17249, 17253, 17254, 17258, 17260, 17261, 17263, 17267, 17271, 17281, 17283, 17290, 17296, 17303, 17306, 17315, 17325, 17327, 17330, 17333, 17335, 17336, 17339, 17346, 17347, 17364, 17367, 17373, 17388, 17391, 17395, 17400, 17409, 17410, 17411, 17415, 17417, 17450, 17454, 17480, 17509, 17526, 17531, 17532, 17533, 17534, 17539, 17555, 17556, 17569, 17573, 17574, 17579, 17580, 17583, 17584, 17587, 17592, 17594, 17602, 17603, 17610, 17611, 17616, 17617, 17622, 17629, 17634, 17636, 17638, 17652, 17654, 17658, 17662, 17665, 17675, 17679, 17682, 17686, 17710, 17713, 17764, 17766, 17771, 17781, 17782, 17787, 17795, 17797, 17801, 17805, 17809, 17811, 17812, 17818, 17825, 17834, 17835, 17836, 17838, 17846, 17847, 17856, 17865, 17869, 17876, 17879, 17887

SWEDEN
17123, 17259, 17291, 17473, 17665, 17846, 17867, 17905

SYNERGISM
17602, 17700, 17730, 17749, 17788, 17815, 17816, 17846

SYNTHETIC FIBERS
17100, 17101, 17247, 17299, 17327, 17519

SYNTHETIC RUBBER
17126

T

TAR
17211, 17244, 17454

TAXATION
17122, 17166, 17849, 17850, 17859, 17866, 17877, 17891, 17898

TECHNICAL SOCIETIES
17425, 17835, 17838, 17841, 17845, 17904

TEFLON
17207

TEMPERATURE
17036, 17063, 17064, 17065, 17093, 17096, 17098, 17100, 17101, 17114, 17120, 17129, 17141, 17145, 17146, 17150, 17161, 17168, 17179, 17183, 17189, 17190, 17191, 17193, 17197, 17202, 17221, 17224, 17225, 17233, 17242, 17250, 17251, 17252, 17255, 17265, 17267, 17270, 17271, 17272, 17273, 17283, 17286, 17292, 17293, 17300, 17301, 17309, 17312, 17322, 17326, 17328, 17333, 17346, 17355, 17357, 17359, 17361, 17365, 17375, 17387, 17393, 17406, 17410, 17412, 17443, 17451, 17454, 17467, 17476, 17485, 17493, 17523, 17534, 17544, 17568, 17663, 17675, 17677, 17683, 17685, 17686, 17691, 17694, 17696, 17697, 17725, 17745, 17746, 17835

TEMPERATURE (ATMOSPHERIC)
17535, 17538, 17543, 17547, 17581, 17594, 17595, 17596, 17599, 17601, 17604, 17620, 17622, 17623, 17625, 17626, 17640, 17643, 17652, 17661, 17727, 17821, 17827, 17865, 17883

TEMPERATURE GRADIENT
17270, 17572, 17594, 17595, 17596, 17604, 17623, 17625, 17640, 17663

TEMPERATURE SENSING INSTRUMENTS
17063, 17093, 17443, 17451, 17454, 17459, 17481

TEST ENGINES
17064, 17089, 17090, 17132, 17141, 17353, 17415

TETRAETHYL LEAD
17047, 17078, 17127, 17155, 17378, 17718, 17830

TEXAS
1749 17566, 17641, 17661

TEXTILE MANUFACTURING
17217, 17287, 17737, 17874

TEXTILES
17100, 17101, 17205, 17247, 17287, 17299, 17327, 17338, 17519

THERMAL RADIATION
17048, 17088, 17106, 17140, 17198, 17208, 17386, 17468, 17625, 17626, 17675, 17871

THERMISTORS
17454, 17459

THERMOCOUPLES
17443, 17454, 17481

THERMODYNAMICS
17050, 17098, 17273, 17328, 17348, 17365, 17637, 17688, 17693

THERMOMETERS
17454

THIN-LAYER CHROMATOGRAPHY
17450

THIOPHENE
17520

THRESHOLDS
17238, 17418, 17454, 17544, 17684, 17702, 17711, 17729, 17789, 17792, 17818, 17835, 17846

TIMED FUEL INJECTION
17057, 17098, 17152

TIN
17772

TIN COMPOUNDS
17163, 17551, 17559, 17572, 17765

TISSUE CULTURES
17706

TISSUES
17522, 17711, 17719, 17722, 17724, 17743, 17744, 17752, 17761, 17778, 17785, 17786, 17791, 17792, 17798

TITANIUM COMPOUNDS
17559

TOBACCO
17815

TOKYO
17564, 17569, 17662, 17879

TOLUENES
17126, 17135, 17362, 17558

TOMATOES
17815

TOPOGRAPHIC INTERACTIONS
17110, 17564, 17572, 17575, 17584, 17594, 17601, 17614, 17623, 17634, 17661, 17663, 17664, 17818, 17883

TOXIC TOLERANCES
17700, 17702, 17775, 17780, 17792, 17793, 17803, 17808, 17814, 17846

TOXICITY
17047, 17109, 17126, 17142, 17146, 17149, 17186, 17188, 17193, 17315, 17468, 17544, 17572, 17650, 17676, 17700, 17701, 17702, 17705, 17706, 17707, 17711, 17714, 17716, 17720, 17725, 17728, 17737, 17740, 17744, 17754, 17758, 17761, 17764, 17765, 17775, 17776, 17779, 17780, 17782, 17785, 17786, 17789, 17792, 17798, 17803, 17811, 17818, 17835, 17840, 17846, 17880, 17904

TRACE ANALYSIS
17053, 17095, 17097, 17424, 17465, 17472, 17477, 17487, 17488, 17489, 17522, 17549, 17700, 17755, 17765, 17771

TRACERS
17078, 17148, 17454, 17588, 17589, 17624, 17630, 17635, 17660, 17663

TRACHEA
17142, 17758, 17781

TRADE ASSOCIATIONS
17121, 17173, 17836

TRAINS
17037, 17536, 17537, 17573, 17856

TRANS-2-BUTENE
17694

TRANSMISSOMETERS
17532

TRANSPORT
17095, 17116, 17547, 17567, 17587, 17593, 17603, 17608, 17614, 17633, 17635, 17681, 17682, 17728

TRAPPING (SAMPLING)
17265, 17437, 17500, 17674

TREES
17788, 17790, 17793, 17794, 17796, 17797, 17800, 17801, 17802, 17808, 17809, 17811, 17813, 17814, 17817

TRUCKS
17076, 17532, 17537

TUBERCULOSIS
17705, 17723

TUMORS
17722, 17749, 17764

TUNNELS
17127

TURBIDIMETRY
17426, 17454, 17497, 17548, 17628, 17835

TURBULENCE (ATMOSPHERIC)
17543, 17583, 17588, 17589, 17591, 17594, 17604, 17614, 17619, 17625, 17639, 17644, 17656, 17660, 17663, 17664, 17681, 17854

TVA
17026, 17369, 17627, 17892

TYNDALLOMETER
17835

U

ULTRASONICS
17299, 17463

ULTRAVIOLET RADIATION
17109, 17468, 17538, 17581, 17610, 17643, 17691, 17835

ULTRAVIOLET SPECTROMETRY
17453, 17480, 17680

UNDERFIRE AIR
17332

UNITED STATES
17102, 17551, 17552, 17662, 17727, 17738, 17742, 17829, 17837, 17839, 17845, 17846, 17853, 17865, 17869, 17893

UPPER ATMOSPHERE
17615, 17621, 17647

URANIUM COMPOUNDS
17712

URBAN AREAS
17031, 17037, 17046, 17047, 17054, 17055, 17056, 17057, 17059, 17061, 17074, 17075, 17076, 17087, 17094, 17109, 17110, 17111, 17116, 17133, 17157, 17321, 17350, 17380, 17409, 17458, 17460, 17473, 17535, 17539, 17540, 17542, 17548, 17549, 17550, 17551, 17552, 17553, 17554, 17555, 17557, 17559, 17560, 17562, 17563, 17564, 17566, 17569, 17570, 17572, 17573, 17576, 17585, 17590, 17594, 17598, 17599, 17601, 17603, 17604, 17605, 17606, 17609, 17614, 17617, 17623, 17632, 17634, 17640, 17641, 17646, 17661, 17662, 17699, 17713, 17714, 17716, 17727, 17733, 17734, 17735, 17739, 17740, 17742, 17748, 17750, 17751, 17753, 17759, 17760, 17765, 17766, 17768, 17769, 17770, 17771, 17774, 17778, 17783, 17794, 17795, 17801, 17802, 17809, 17814, 17819, 17821, 17823, 17826, 17833, 17846, 17847, 17850, 17853, 17859, 17860, 17865, 17866, 17872, 17874, 17876, 17878, 17879, 17882, 17883, 17886, 17893, 17894, 17897, 17900, 17901

URINALYSIS
17435, 17704, 17707, 17708, 17712, 17718, 17720, 17737, 17752, 17756, 17757, 17772, 17786, 17791

USSR
17180, 17185, 17216, 17220, 17265, 17268, 17286, 17289, 17299, 17337, 17341, 17362, 17366, 17384, 17392, 17412, 17413, 17458, 17461, 17468, 17471, 17487, 17500, 17514, 17520, 17547, 17558, 17563, 17576, 17591, 17594, 17600, 17619, 17621, 17622, 17628, 17650, 17653, 17664, 17674, 17686, 17689, 17696, 17698, 17714, 17729, 17761, 17763, 17809, 17826, 17844, 17845, 17846, 17883

V

VALLEYS
17584, 17594, 17658, 17663, 17834

VANADIUM COMPOUNDS
17161, 17206, 17226, 17265, 17273, 17293, 17341, 17363, 17508, 17551, 17559, 17560, 17562, 17699

VAPOR PRESSURE
17386, 17419

VAPOR RECOVERY SYSTEMS
17117, 17174, 17185, 17232, 17331, 17368, 17399, 17831

VAPORS
17077, 17083, 17103, 17117, 17182, 17183, 17184, 17242, 17247, 17253, 17325, 17336, 17355, 17375, 17386, 17388, 17393, 17399, 17491, 17493, 17504, 17518, 17528, 17563, 17577, 17581, 17652, 17698, 17725, 17820, 17838, 17856

VARNISHES
17343

VEGETABLES
17793, 17802, 17804, 17815, 17816

VENTILATION
17074, 17081, 17117, 17202, 17370, 17393, 17401, 17402, 17409, 17544, 17572, 17863

VENTURI SCRUBBERS
17058, 17160, 17189, 17191, 17219, 17221, 17236, 17238, 17280, 17283, 17295, 17302, 17318, 17320, 17368, 17394, 17440

VERMONT
17536

VIRGINIA
17043, 17173

VIRUSES
17083, 17730

VISIBILITY
17101, 17116, 17127, 17146, 17540, 17556, 17569, 17579, 17580, 17584, 17596, 17599, 17616, 17651, 17655, 17658, 17675, 17834, 17901

VISIBLE RADIATION
17691

VOLATILITY
17042, 17147, 17371, 17375, 17436, 17473, 17493, 17571, 17674, 17889

VOLCANOES
17104, 17643

VOLTAGE
17085, 17133, 17222, 17289, 17297, 17339, 17347, 17376, 17395, 17449, 17456, 17457, 17474, 17667

W

WASHINGTON D C
17032, 17173, 17566, 17821, 17881

WASHOUT
17594, 17607, 17642, 17645, 17659

WATER
17029, 17083, 17103, 17165, 17201, 17272, 17319, 17355, 17459, 17577, 17579, 17581, 17630, 17645, 17649, 17652, 17677, 17698, 17740, 17820

WATER POLLUTION
17026, 17027, 17029, 17048, 17056, 17058, 17062, 17097, 17135, 17139, 17144, 17213, 17235, 17247, 17356, 17448, 17525, 17527, 17556, 17563, 17657, 17672, 17673, 17728, 17740, 17784, 17811, 17849, 17855, 17856, 17866, 17867, 17868, 17871, 17875, 17891, 17893

WEATHER MAPS
17569

WEATHER MODIFICATION
17109, 17110, 17575, 17581, 17599, 17620, 17626, 17634, 17643, 17652, 17891

WEST AND GAEKE METHOD
17524

WET CYCLONES
17146, 17221, 17302, 17324, 17392, 17523, 17543

WETTING
17216

WINDS
17069, 17109, 17112, 17116, 17136, 17140, 17202, 17402, 17416, 17438, 17535, 17543, 17549, 17550, 17553, 17564, 17567, 17578, 17580, 17583, 17585, 17586, 17589, 17590, 17593, 17594, 17595, 17596, 17598, 17599, 17601, 17604, 17608, 17609, 17613, 17614, 17623, 17624, 17627, 17635, 17636, 17638, 17639, 17644, 17645, 17652, 17656, 17659, 17660, 17661, 17663, 17812, 17834, 17865, 17876, 17883

WISCONSIN
17173

WOOD
17037, 17112, 17146, 17536, 17686

X

X-RAYS
17182, 17354, 17442, 17465, 17472, 17492, 17824

XYLENES
17362, 17558

Z

ZINC
17036, 17212, 17266, 17755

ZINC COMPOUNDS
17082, 17085, 17115, 17142, 17163, 17212, 17266, 17560, 17672, 17699, 17802

AUTHOR INDEX

A

ABE H
ESTIMATION OF AIR POLLUTANTS DEPOSITION ON INSULATOR BY CHEMICAL ANALYSES.
17824 APTIC NO. 35460

ABRAMO S V
ENVIRONMENT AND HEALTH. AIR QUALITY ACT OF 1967.
*17858 APTIC NO. 35664

ACOCELLA G
CHEMOTHERAPY OF EXPERIMENTAL LEAD POISONING. NOTE II. EFFECTS OF NICOTINIC ACID ON COPROPORPHYRINURIA IN LEAD POISONED RATS.
*17704 APTIC NO. 35174

ADAMS D F
TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS).
*17426 APTIC NO. 35728

ADAMS R G
OVERHEAD VALVE ACTION AND AIR POLLUTANT DEVICE.
17398 APTIC NO. 35738

ADAMS W E
MEETING FUTURE EMISSION STANDARDS WITH LEADED FUELS.
*17178 APTIC NO. 35778

ADELAJA A
VARIABILITY OF OXIDANT LEVELS AT MONITORING STATIONS 100 FEET APART.
17452 APTIC NO. 35309

AITKEN J
DUST, FOGS, AND CLOUDS.
*17577 APTIC NO. 35661

ON IMPROVEMENTS IN THE APPARATUS FOR COUNTING THE DUST PARTICLES IN THE ATMOSPHERE.
*17427 APTIC NO. 35677

ON THE NUMBER OF DUST PARTICLES IN THE ATMOSPHERE OF CERTAIN PLACES IN GREAT BRITAIN AND ON THE CONTINENT, WITH REMARKS ON THE RELATION BETWEEN THE AMOUNT OF DUST AND METEOROLOGICAL PHENOMENA.
*17578 APTIC NO. 35678

ON A SIMPLE POCKET DUST-COUNTER.
*17428 APTIC NO. 35679

ON THE NUMBER OF DUST PARTICLES IN THE ATMOSPHERE.
*17429 APTIC NO. 35680

ON THE SOLID AND LIQUID PARTICLES IN CLOUDS.
*17579 APTIC NO. 35681

ON SOME OBSERVATIONS MADE WITHOUT A DUST COUNTER ON THE HAZING EFFECT OF ATMOSPHERIC DUST.
*17540 APTIC NO. 35682

ON THE FORMATION OF DEFINITE FIGURES BY THE DEPOSITION OF DUST.
*17666 APTIC NO. 35684

AIZAWA K
FLUIDIZED BED INCINERATION SYSTEM.
*17179 APTIC NO. 35496

AIZAWA R
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

AIZENBERG B SH
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
*17180 APTIC NO. 35478

AKAGI M
STUDY ON COMBUSTION GAS FROM A PREDETERMINED AMOUNT OF COMBUSTION (I). EFFECT OF THE WALL TEMPERATURE AND THE PRESSURE OF AIR-FUEL MIXTURE ON FORMATION OF EXHAUST GAS.
17387 APTIC NO. 35839

AKIMOTO H
NITROGEN DIOXIDE CATALYZED CIS-TRANS ISOMERIZATION OF CIS-2 BUTENE.
17694 APTIC NO. 36016

ALEKSANDROV V P
CHOICE OF ELECTROSTATIC PRECIPITATOR COMPONENTS IN HIGH CAPACITY UNITS, AND THEIR MODELLING.
17268 APTIC NO. 35874

ALEX W
A CRITICAL OBSERVATION ON METHODS FOR ANALYSIS OF THE SIZES OF FINE PARTICLES.
17513 APTIC NO. 35627

ALEXANDER R M
THE OVERVIEW.
*17049 APTIC NO. 35255

ALFORD E H
THE DESIGN AND DEVELOPMENT OF A TURBINE-GEARBOX FOR USE IN AN AUTOMOTIVE ORGANIC RANKINE CYCLE SYSTEM.
17051 APTIC NO. 35202

ALLCROFT R
LEAD POISONING IN CATTLE AND SHEEP.
*17785 APTIC NO. 35210

ALLCUT E A
AIR SANITATION.
*17903 APTIC NO. 35608

ALLEMAN J A
FUNDAMENTALS OF THE AIR POLLUTION ACT.
*17859 APTIC NO. 35105

ALLEN D W
TRANSFER OF IRON FROM SERUM IRON-BINDING PROTEIN TO HUMAN RETICULOCYTES.
17745 APTIC NO. 35233

ALLISON A C
LYSOSOMES AND THE TOXICITY OF PARTICULATE POLLUTANTS.
*17705 APTIC NO. 35334

ALONSO J R F
ESTIMATING THE COSTS OF GAS-CLEANING PLANTS.
*17831 APTIC NO. 35532

ALTSHULLER A P
DISCUSSION OF NATIONAL AIR QUALITY STANDARDS FOR AUTOMOTIVE POLLUTANTS: A CRITICAL REVIEW.
17837 APTIC NO. 35384

ALVERSON T E
INFLUENCE OF MECHANICAL COLLECTION ON ELECTROSTATIC PRECIPITATOR SPARKOVER VOLTAGE - A LABORATORY SIMULATION.
17339 APTIC NO. 35471

ANDERSEN A A
A SAMPLER FOR RESPIRATORY HEALTH HAZARD ASSESSMENT.
*17430 APTIC NO. 35636

ANDERSON D H
DETERMINATION OF MERCURY BY A COMBUSTION TECHNIQUE USING GOLD AS A COLLECTOR.
*17431 APTIC NO. 35826

ANDO J
ECONOMICS OF FLUE GAS DESULFURIZATION.
*17181 APTIC NO. 35996

ANDRES R H
POLLUTION CONTROL AT A LARGER FERTILIZER COMPLEX.
17058 APTIC NO. 35985

ANDREWS D M

VAPOR PHASE IMPREGNATION OF ACTIVE CARBONS.
*17182 APTIC NO. 35572

VAPOR PHASE IMPREGNATION OF ACTIVE CARBONS. QUARTERLY PROGRESS REPORT NO. 3. (JULY THROUGH SEPTEMBER 1969).
*17183 APTIC NO. 35686

VAPOR PHASE IMPREGNATION OF ACTIVE CARBONS. QUARTERLY PROGRAM REPORT NO. 1 JANUARY THROUGH MARCH 1969.
*17184 APTIC NO. 35687

ANDRIANOV A P

A COMBINED METHOD FOR THE REMOVAL OF SULFUR OXIDES FROM FLUE GASES.
*17185 APTIC NO 35237

AOKI T

DUST COLLECTOR.
*17186 APTIC NO. 35916

DUST COLLECTOR.
*17187 APTIC NO. 35936

DUST COLLECTOR.
*17188 APTIC NO. 35942

APPELT W

SEPARATION OF BROMINE FROM GASEOUS MIXTURES CONTAINING OXIDES OF NITROGEN.
17677 APTIC NO. 35299

APPLEMAN H

A NOTE ON THE EFFECT OF AIRCRAFT EXHAUST ON AIRPORT VISIBILITY.
*17580 APTIC NO. 35583

ARATO E S

SIMULTANEOUS DETERMINATION OF ARSENIC AND PHOSPHORUS FROM THE AIR.
*17432 APTIC NO. 35847

ARCEIVALA S J

SHORT-TERM AIR QUALITY SURVEYS IN 4 MAJOR CITIES OF INDIA.
17573 APTIC NO. 35534

ARGIROVA M

POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO 35386

ARONSON A L

STUDIES WITH CALCIUM ETHYLENEDIAMINETETRAACETATE IN CALVES: TOXICITY AND USE IN BOVINE LEAD POISONING.
*17786 APTIC NO. 35209

ARTEMYEV N I

PRODUCTION OF SULFURIC ACID FROM REVERBERATORY FURNACE FLUE GASES.
17337 APTIC NO. 35333

ASANO K

ABSORPTION OF SULFUR DIOXIDE IN N, N-DIMETHYLANILINE WITH CORONA DISCHARGE.
*17667 APTIC NO. 35046

ATWATER M A

RADIATIVE EFFECTS OF POLLUTANTS IN THE ATMOSPHERIC BOUNDARY LAYER.
*17581 APTIC NO. 35763

AUSTIN R L

THE TRITILOG AND ITS APPLICATION TO CONTINUOUS MEASUREMENT OF SULFUR CONCENTRATION IN STREAMS. PART II: FIELD APPLICATIONS.
*17433 APTIC NO. 35642

AVDEYEVA AV

PRODUCTION OF SULFUR FROM SULFUR DIOXIDE.
17412 APTIC NO. 35413

AYALA A M

RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

AZUMA H

THE CHEMICO TYPE STACK GAS DESULFURIZATION SYSTEM.
17283 APTIC NO. 35832

B

BACKUS E

MINICIPAL INCINERATOR DEFEATS POLLUTION/CORROSION PROBLEMS.
*17189 APTIC NO. 35340

BADCOCK C C

PHOTOOXIDATION OF SULFUR DIOXIDE.
17649 APTIC NO. 35856

BADOWSKA I

STUDIES ON THE PRODUCTION OF SULPHURIC ACID FROM GASES OF LOW SULPHUR DIOXIDE CONCENTRATION BY CATALYTIC SOLUTION METHOD.
*17190 APTIC NO. 35526

BAGG J

THE FORMATION OF OXIDES OF HYDROGEN IN FLAMES.
*17050 APTIC NO. 35533

BAGWELL F A

NEW DEVELOPMENTS IN DUST COLLECTING EQUIPMENT FOR ELECTRIC UTILITIES. TI-5 PUBLIC UTILITIES COMMITTEE SURVEY REPORT NO. 1.
*17191 APTIC NO. 35286

BAKER F D

MODIFIED ROLLER DRUM APPARATUS FOR ANALYZING EFFECTS OF POLLUTANT GASES ON TISSUE CULTURE SYSTEMS.
*17706 APTIC NO. 35522

BAKER R V

AN AUTOMATIC CONTROL SYSTEM FOR DIRECT COMPARISONS OF AIR POLLUTION ABATEMENT EQUIPMENT.
17338 APTIC NO. 35927

BALABREVA D

POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

BALDWIN T

SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

BALL G V

CHRONIC LEAD INGESTION AND GOUT.
*17707 APTIC NO. 35211

BALLARD L F

FIELD EVALUATION OF SULFUR DIOXIDE MONITORING INSTRUMENTS.
17524 APTIC NO. 35191

BANCZYK L

PROCESSING INTO SULPHURIC ACID OF GASES OBTAINED FROM PHOSPHOGYPSUM ROASTING.
*17192 APTIC NO. 35044

BANDO S

CHOICE OF ACTIVABLE TRACER FOR SPRAYING ARGICULTURAL INSECTICIDES BY HELICOPTER.
*17434 APTIC NO. 35621

BANIC G M

PRESENT STATUS OF ELECTROMAGNETIC SEPARATION OF STABLE ISOTOPES AT THE OAK RIDGE NATIONAL LABORATORY.
17308 APTIC NO. 35653

BAPSERES P

DISPERSION OF POLLUTANTS AND THE MICROCLIMATE AT LACQ.
*17582 APTIC NO. 35702

BARANOV A V

ABSORPTION OF NITROGEN OXIDES BY ACID SUSPENSION OF VANADIUM PENTOXIDE.
17341 APTIC NO. 35772

BARBER R E

THE DESIGN AND DEVELOPMENT OF A TURBINE-GEARBOX FOR USE IN AN AUTOMOTIVE ORGANIC RANKINE CYCLE SYSTEM.
*17051 APTIC NO. 35202

BARLTROP D

FACTORS INFLUENCING EXPOSURE OF CHILDREN TO LEAD.
*17900 APTIC NO. 35206

THE EXCRETION OF DELTA-AMINOLAEVULINIC ACID BY CHILDREN.
*17708 APTIC NO. 35377

BARRIERO O C

EFFECT OF CYSTEINE ON 5-AMINOLAEVULINATE HYDROLYASE FROM LIVER IN TWO CASES OF EXPERIMENTAL INTOXICATION.
*17709 APTIC NO. 35225

BARRON C I

EFFECTS OF ELECTRIC FIELDS AND NEGATIVE ION CONCENTRATIONS ON TEST PILOTS.
*17435 APTIC NO. 35156

BARTH C L

IDENTIFYING ODOROUS COMPONENTS OF STORED DAIRY MANURE.
*17436 APTIC NO. 35865

BARTH D S
DISCUSSION OF NATIONAL AIR QUALITY STANDARDS FOR AUTOMOTIVE POLLUTANTS: A CRITICAL REVIEW.
*17837 APTIC NO. 35384

BASU P K
THE EFFECT OF AIR POLLUTANTS ON THE EYE. II. A STUDY OF THEIR EFFECT ON THE OCULOCARDIAC REFLEX.
*17710 APTIC NO. 35486

BATCHELOR G K
DIFFUSION FROM SOURCES IN A TURBULENT BOUNDARY LAYER.
*17583 APTIC NO. 35193

BATES E M
FIELD BURNING VS. ATMOSPHERIC VISIBILITY.
*17584 APTIC NO. 35268

BAUDELAIRE J
ACTION IN THE LIME AND CEMENT INDUSTRY.
*17193 APTIC NO. 35094

BAXTER H G
THE DESIGN, OPERATION AND HAZARDS OF A DETERGENT ALKYLATE PLANT.
*17711 APTIC NO. 35280

BAYES K D
ENERGY TRANSFER FROM ELECTRONICALLY EXCITED N 2.
17617 APTIC NO. 35493

BAYTASOV U B
EFFICIENCY OF DUST-WETTING AGENTS IN AIR DUST REMOVAL.
17216 APTIC NO. 35447

BEAVON D K
ADD-ON PROCESS SLASHES CLAUS TAILGAS POLLUTION.
*17194 APTIC NO. 35307

BECKER E
PROCESS FOR THE MANUFACTURE OF SEPARATION NOZZLES AND THE SEPARATION NOZZLE MADE IN ACCORDANCE WITH THE PROCESS.
17399 APTIC NO. 35325

BECKER P M
APPLICATION OF COMPUTER SIMULATION TECHNIQUES TO THE PREDICTION OF FLAME GAS EMISSIONS: THE EFFECTS OF ELECTRIC FIELDS ON FLAME PROPERTIES.
17683 APTIC NO. 35270

BEER J M
THE FORMATION OF OXIDES OF NITROGEN IN A COMBUSTION SYSTEM.
17145 APTIC NO. 35228

BELIKOV A G
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
17180 APTIC NO. 35478

BELL D G
CENTRIFUGAL SEPARATORS.
*17195 APTIC NO. 35740

BELL R F
URINARY LEAD-210 AS INDEX OF MINE RADON EXPOSURE.
*17712 APTIC NO. 35382

BELL W A JR
PRESENT STATUS OF ELECTROMAGNETIC SEPARATION OF STABLE ISOTOPES AT THE OAK RIDGE NATIONAL LABORATORY.
17308 APTIC NO. 35653

BELYAKOV A A
DETERMINATION OF ATRAZINE, CYANURCHLORIDE, HYDROGEN CYANIDE AND ALIPHATIC AMINES IN THE AIR.
17500 APTIC NO. 35136

BENEDICT H M
THE MARKINGS PRODUCED BY VARIOUS AIR POLLUTANTS ON LEAVES.
*17787 APTIC NO. 35613

BERDICK M
OBJECTIVE MEASUREMENT OF ODOR: IONIZATION DETECTION OF FOOD VOLATILES.
17493 APTIC NO. 35648

BERGE H
SENSITIVITY OF LEAFED TREES AND CONIFERS TO IMMISSIONS IN DEPENDENCE OF LOCATION FACTORS.
*17788 APTIC NO. 35272

BERINDAN C
ATMOSPHERIC POLLUTION AND HISTORICAL MONUMENTS. PROBLEM OF CONTEMPORARY URBANISM
*17819 APTIC NO. 35356

BERKOWITZ J
ELECTRON AFFINITIES OF 02, 03, NO, NO2, NO3 BY ENDOTHERMIC CHARGE TRANSFER.
*17668 APTIC NO. 35063

BERLY E
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

BERLY E M
REMOVAL OF SOLUBLE GASES AND PARTICULATES FROM AIR STREAMS WITH SPECIAL REFERENCE TO FLUORIDES.
*17196 APTIC NO. 35448

BERNERT J
EXPERIENCES GAINED DURING DETERMINING THE HYDROGEN SULFIDE CONTENT IN WASTE GASES.
*17437 APTIC NO. 35967

BERNSTEIN L S
APPLICATION OF CATALYSTS TO AUTOMOTIVE NOX EMISSIONS CONTROL.
*17197 APTIC NO. 35223

BEYER E M JR
ABSCISSION. THE ROLE OF ETHYLENE MODIFICATION OF AUXIN TRANSPORT.
*17789 APTIC NO. 35062

BIBBERO R J
SYSTEMS APPROACH TOWARD NATIONWIDE AIR-POLLUTION CONTROL. III. MATHEMATICAL MODELS.
*17585 APTIC NO. 35776

BIEN C T
ADHERENCE ON INLET CONDITIONS FOR SELECTED AEROSOL SAMPLING INSTRUMENTS TO SUGGESTED CRITERIA.
*17438 APTIC NO. 35122
PERFORMANCE OF RESPIRABLE DUST SAMPLERS WITH FIBROUS DUST.
*17439 APTIC NO. 35976

BIGNARDI L
SMOKE DENSITY METER.
*17440 APTIC NO. 35500

BILLER W F
THE COMPOSITION AND ODOR OF DIESEL EXHAUST.
17128 APTIC NO. 35635

BILLINGS C
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

BINFORD F T
SOME TECHNIQUES FOR ESTIMATING THE RESULTS OF THE EMISSION OF RADIOACTIVE EFFLUENTS FROM ORNL STACKS.
*17586 APTIC NO. 35433

BINGHAM E C
AIR POLLUTION PROBLEMS AT A NITROGEN FERTILIZER PLANT.
*17198 APTIC NO. 35886

BJERLE I
ABSORPTION CLEANING OF FLUE GASES AND SMOKES.
*17199 APTIC NO. 35947

BLACKER J H
A DILUTION SYSTEM FOR DYNAMIC PREPARATION OF GAS CONCENTRATIONS.
*17441 APTIC NO. 35935

BLANK R E
MOLECULAR CONSTANTS OF NO2 FROM HIGH-RESOLUTION ABSORPTION SPECTRA AND MAGNETIC CIRCULAR DICHROISM AND MAGNETIC CIRCULAR BIREFRINGENCE OF NO AND NO2.
*17669 APTIC NO. 35862

BLOCH W N JR
SWIMMING AS A LABORATORY METHOD FOR EXERCISING DOGS.
*17670 APTIC NO. 35683

BLOSSER E R
IDENTIFICATION AND ESTIMATION OF IONS, MOLECULES, AND COMPOUNDS IN PARTICULATE MATTER COLLECTED FROM AMBIENT AIR. (FINAL REPORT).
*17442 APTIC NO. 35426

BLUME J H
REMOVE SULFUR FROM FUEL OIL AT LOWEST COST.
•17200 APTIC NO. 35654

BLUNDI E
AIR POLLUTION AND ITS ACTION UPON THE RESPIRATORY SYSTEM.
•17713 APTIC NO. 35134

BOHN H L
A CLEAN NEW GAS.
•17201 APTIC NO. 35285

BOHNENKAMP K
LABORATORY STUDY OF ATMOSPHERIC CORROSION.
•17820 APTIC NO. 35159

BONASHEVSKAYA T I
EXPERIMENTAL INVESTIGATION OF THE BIOLOGICAL EFFECT OF MICROCONCENTRATIONS OF PENTANE AND HEXANE MIXTURE IN THE AIR.
•17714 APTIC NO. 35760

BOND J C
THE DESIGN AND DEVELOPMENT OF A TURBINE-GEARBOX FOR USE IN AN AUTOMOTIVE ORGANIC RANKINE CYCLE SYSTEM.
17051 APTIC NO. 35202

BONLIE R W
DEVELOPMENT AND TESTING OF MOBILE FIELD INCINERATOR.
•17052 APTIC NO. 35260

BOOTH M R
CHEMICAL ANALYSIS AND COMPOSITION OF FLUE GASES.
•17053 APTIC NO. 36021

BORISOFF B
BATTERY POWERED ELECTRIC BUSES.
•17054 APTIC NO. 35238

BORLAND J E
APPLYING A NEW METHOD FOR MEASURING BENZO(A)PYRENE IN VEHICLE EXHAUST TO THE STUDY OF FUEL FACTORS.
17078 APTIC NO. 35919

BOSCH J C
SIZE DISTRIBUTION OF AEROSOLS FROM A KRAFT MILL RECOVERY FURNACE.
•17541 APTIC NO. 35051

BOTKIN D B
OZONE SUPPRESSION OF WHITE PINE NET PHOTOSYNTHESIS.
•17790 APTIC NO. 35287

BOUBEL R W
EMISSION SAMPLING FROM GRASS BURNING.
•17443 APTIC NO. 35241

BOUHUYS A
AIRWAY DYNAMICS AND BRONCHOACTIVE AGENTS IN MAN.
•17715 APTIC NO. 35188

BOUQUIAUX J
AIR POLLUTION BY SMOKE AND SO2.
•17542 APTIC NO. 35422

PRINCIPLES AND METHODS OF STUDY OF THE ENVIRONMENT IN BELGIUM.
•17860 APTIC NO. 35701

BOYLE R W
GEOCHEMISTRY OF MERCURY AND ORIGINS OF NATURAL CONTAMINATION OF THE ENVIRONMENT.
17095 APTIC NO. 36011

BOYNE L
GENERATION OF A SODIUM CHLORIDE AEROSOL FOR IN-PLACE TESTING OF AIR FILTERS.
•17444 APTIC NO. 35876

BRAMAN R S
DIRECT CURRENT DISCHARGE EMISSION SPECTRA FOR DETECTION AND IDENTIFICATION OF SOME AIR POLLUTANT COMPOUNDS.
•17445 APTIC NO. 35121

BRANDES A
ENVIRONMENTAL PROTECTION AND SAFETY MEASURES AT THE VAHR POWER STATION.
•17202 APTIC NO. 35165

BRANDES H
EXPERIMENTAL STUDIES OF CENTRIFUGAL SEPARATORS. PART I.
•17203 APTIC NO. 35977

BREHOB W M
MECHANISMS OF POLLUTANT FORMATION AND CONTROL FROM AUTOMOTIVE SOURCES.
•17204 APTIC NO. 35857

BREITBACH P
FILTERING LAYER MANUFACTURING METHOD AND MEANS.
•17205 APTIC NO. 35885

BRIEF R S
THE EMISSION INVENTORY.
•17446 APTIC NO. 35242

VARIABILITY OF OXIDANT LEVELS AT MONITORING STATIONS 100 FEET APART.
17452 APTIC NO. 35309

A DILUTION SYSTEM FOR DYNAMIC PREPARATION OF GAS CONCENTRATIONS.
17441 APTIC NO. 35935

BRIGGS G A
METEOROLOGICAL BEHAVIOR OF COMBUSTION PRODUCTS RELEASED AT THE BLANCO PLANT.
17598 APTIC NO. 35208

BROCKE W
OIL BURNER SOOT EMISSION.
•17206 APTIC NO. 35944

BROCKHAUS A
INVESTIGATIONS ON THE BENZO(A)PYRENE CONTENT OF HUMAN LUNGS.
17779 APTIC NO. 35972

BRODOVICH A I
BRUSH DISCHARGE FILTERS USED FOR THE REMOVAL OF NITRIC OXIDE FROM COKE OVEN GAS.
17289 APTIC NO. 35759

BROUGH J
THE FILTRATION OF AIR USING FIBROUS FILTERS.
17208 APTIC NO. 35550

BROWDER T J
LATEST DEVELOPMENTS AND MODERN TECHNOLOGY IN THE SULFURIC ACID INDUSTRY.
•17207 APTIC NO. 35665

BROWN F B
BARRIERS TO LINEARITY IN TRIATOMIC MOLECULES. I. DEVELOPMENT OF A CURVILINEAR QUANTUM MECHANICAL MODEL APPROPRIATE FOR LARGE AMPLITUDE BENDING MOTION IN TRIATOMIC MOLECULES OF C2V SYMMETRY.
•17671 APTIC NO. 35978

BROWN R F
ELECTRICALLY SUPPORTED LIQUID COLUMNS IN HIGH-PRESSURE ELECTROSTATIC PRECIPITATORS.
17347 APTIC NO. 35521

BROWN T D
THE FORMATION OF OXIDES OF NITROGEN IN A COMBUSTION SYSTEM.
17145 APTIC NO. 35228

BRUIN A D
TOXICOLOGICAL APPRAISAL OF LEAD AS PUBLIC HEALTH HAZARD.
•17716 APTIC NO. 35792

BUCK W B
BEHAVIORAL AND NEUROLOGICAL EFFECTS OF LEAD.
•17791 APTIC NO. 35234

BUKHANOVSKII D L
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
17180 APTIC NO. 35478

BULL G A
BLUE SUN AND MOON.
•17587 APTIC NO. 35643

BULTYNCK H
TURBULENT DIFFUSION OF EFFLUENTS EMITTED CONTINUOUSLY INTO A STABLE ATMOSPHERE BY AN ELEVATED EMISSION SOURCE VOLUME II (FIGURES).
•17588 APTIC NO. 35203

TURBULENT DIFFUSION OF EFFLUENTS EMITTED CONTINUOUSLY INTO A STABLE ATMOSPHERE BY AN ELEVATED EMISSION SOURCE VOLUME I (TEXT).
•17589 APTIC NO. 35629

BURMANN F J
ATMOSPHERIC SURVEILLANCE THE CURRENT STATE OF AIR MONITORING TECHNOLOGY.
17479 APTIC NO. 35320

BURT W T III
AIR POLLUTION FROM HOT MIX PLANTS.
*17543 APTIC NO. 35227

BURTON R W
ON AFFECTING THE LONG-TERM AIR QUALITY IN THE SAN FRANCISCO BAY AREA.
*17590 APTIC NO. 35753

BUSCH G E
PHOTOFRAGMENT SPECTROMETER.
*17447 APTIC NO. 35179

BUSCH K A
SWIMMING AS A LABORATORY METHOD FOR EXERCISING DOGS.
17670 APTIC NO. 35683

BUURMA I J
INTRODUCTION TO THE PROBLEM OF AIR POLLUTION IN NETHERLANDS.
*17055 APTIC NO. 35138

BYALYY B I
STUDIES ON THE REGENERATION OF UNWOVEN FILTER FABRICS.
17299 APTIC NO. 35758

BYERS R K
LATE EFFECTS OF LEAD POISONING ON MENTAL DEVELOPMENT.
*17717 APTIC NO. 35438

BYZOVA N L
ANALYSIS OF CONCENTRATION RANGE OF A HEAVY CONTAMINANT ON THE BASIS OF DATA FROM A 300-METRE HIGH METEOROLOGIC TOWER.
*17591 APTIC NO. 35409

C

CAFFIN D A
THE FILTRATION OF AIR USING FIBROUS FILTERS.
*17208 APTIC NO. 35550

CAHILL T A
SENSITIVITY VERSUS TARGET BACKINGS FOR ELEMENTAL ANALYSIS BY ALPHA EXCITED X-RAY FLUORESCENCE.
17465 APTIC NO. 35591

CAIRNS E J
LITHIUM/SULFUR CELLS AND THEIR POTENTIAL FOR VEHICLE PROPULSION.
17133 APTIC NO. 35539

CALVERT J G
PHOTOACTIVATED SURFACE REACTIONS.
*17592 APTIC NO. 35451

PHOTOOXIDATION OF SULFUR DIOXIDE.
17649 APTIC NO. 35856

CAMERON A E
PRESENT STATUS OF ELECTROMAGNETIC SEPARATION OF STABLE ISOTOPES AT THE OAK RIDGE NATIONAL LABORATORY.
17308 APTIC NO. 35653

CAMERON J F
RADIOISOTOPE TECHNIQUES FOR MEASUREMENT AND CONTROL OF INDUSTRIAL POLLUTION.
*17448 APTIC NO. 35899

CAMPBELL J M
LUNG CANCER DEATH RATES AMONG NON-SMOKERS AND PIPE AND CIGARETTE SMOKERS. AN EVALUATION IN RELATION TO AIR POLLUTION BY BENZPYRENE AND OTHER SUBSTANCES.
17771 APTIC NO. 35603

CAMPBELL R E
PROCESS FOR RECOVERING A METAL OXIDE AND SULFUR DIOXIDE FROM METAL SULFATE.
*17209 APTIC NO. 35512

CANISIUS C
A FILTER PAD FOR THE FILTRATION OF GASES AND OF LIQUIDS.
*17210 APTIC NO. 35103

CARBONE W E
COKE-OVEN EMISSION CONTROL.
*17211 APTIC NO. 35284

CARLSON R W
OZONE SUPPRESSION OF WHITE PINE NET PHOTOSYNTHESIS.
17790 APTIC NO. 35287

CARPENTER K E
THE LEAD MINE AS AN ACTIVE AGENT IN RIVER POLLUTION.
*17672 APTIC NO. 35378

ON THE BIOLOGICAL FACTORS INVOLVED IN THE DESTRUCTION OF RIVER-FISHERIES BY POLLUTION DUE TO LEAD-MINING.
*17673 APTIC NO. 35379

A STUDY OF THE FAUNA OF RIVERS POLLUTED BY LEAD MINING IN THE ABERYSTWYTH DISTRICT OF CARDIGANSHIRE.
*17056 APTIC NO. 35398

CASSELLS D A K
TETRA-ETHYL LEAD POISONING.
*17718 APTIC NO. 35559

CASSIDY P E
DEVELOPMENT OF A TEST FACILITY AND SPECIFICATION FOR BREATHABLE AIR FILTERS. (FINAL REPORT).
17306 APTIC NO. 35251

CATTELAIN C
METHOD FOR TREATING ZINC BLAST FURNACE GASES.
*17212 APTIC NO. 35303

CAVE P R
EXPERIMENTAL AND ANALYTICAL SCAVENGING STUDIES ON A TWO-CYCLE OPPOSED PISTON DIESEL ENGINE.
17148 APTIC NO. 35475

CAVE R W
EFFLUENT DISPOSAL IN AN INTEGRATED WORKS.
*17213 APTIC NO. 35830

CAWLEY C
THE MELCHETT LECTURE FOR 1967. SOME ASPECTS OF FORMULATING A NATIONAL FUEL POLICY.
*17861 APTIC NO. 35724

CERMAK J E
THE DIABATIC WIND AND TEMPERATURE PROFILES.
17595 APTIC NO. 35690

CHAPRON Y
PROCESS AND APPARATUS FOR DETECTION OF IMPURITIES AND APPLICATIONS OF THE PROCESS.
*17449 APTIC NO. 35954

CHAPUT H
URBAN TRANSPORATION AND EMISSIONS.
*17057 APTIC NO. 35711

CHARLES N G
BARRIERS TO LINEARITY IN TRIATOMIC MOLECULES. I. DEVELOPMENT OF A CURVILINEAR QUANTUM MECHANICAL MODEL APPROPRIATE FOR LARGE AMPLITUDE BENDING MOTION IN TRIATOMIC MOLECULES OF C2V SYMMETRY.
17671 APTIC NO. 35978

CHATOT G
PURIFICATION OF ATMOSPHERIC POLYCYCLIC AROMATIC HYDROCARBONS BY THIN LAYER CHROMATOGRAPHY.
*17450 APTIC NO. 35131

CHAYKIN A S
REDUCING AIR POLLUTION FROM MINING EXPLORATION WITH DIESEL ENGINES.
17384 APTIC NO. 35756

CHEPIK N G
THE EFFECT OF OROGRAPHY ON THE CHARACTERISTICS OF THE AIR FLOW WITHIN THE AERODYNAMIC TUBE.
17664 APTIC NO. 35421

CHESTER R
DUST TRANSPORTED IN THE NORTH-EAST AND SOUTH-EAST TRADE WINDS IN THE ATLANTIC OCEAN.
*17593 APTIC NO. 35536

CHIANG T K
TURBULENCE INDUCING ELECTROGASDYNAMIC PRECIPITATOR.
17241 APTIC NO. 35499

CHILCOTE D O
ALTERNATIVES TO OPEN BURNING AND BASIC PHYSIOLOGICAL STUDIES.
*17214 APTIC NO. 35171

CHIRAKADZE G I
THE CLIMATE OF TIBILISI AND OF ITS NEW BOUNDARIES.
*17594 APTIC NO. 35420

CHISOLM J J JR
CHRONIC LEAD INTOXICATION IN CHILDREN.
*17719 APTIC NO. 35380

THE USE OF CHELATING AGENTS IN THE TREATMENT OF ACUTE AND

CHRONIC LEAD INTOXICATION IN CHILDHOOD.
*17720 APTIC NO. 35387

DETERMINATION OF DELTA-AMINOLEVULINIC ACID IN PLASMA.
*17721 APTIC NO. 35560

CHRISTEN G
PROCESS FOR SEPARATION OF A GAS.
*17215 APTIC NO. 35970

CHUANG H
THE DIABATIC WIND AND TEMPERATURE PROFILES.
*17595 APTIC NO. 35690

CHULAKOV P CH
EFFICIENCY OF DUST-WETTING AGENTS IN AIR DUST REMOVAL.
*17216 APTIC NO. 35447

CHUPKA W A
ELECTRON AFFINITIES OF 02, 03, NO, NO2, NO3 BY ENDOTHERMIC CHARGE TRANSFER.
17668 APTIC NO. 35063

CICCHELLA G
INVESTIGATION OF MERCURY IN THE CEREBROSPINAL FLUID OF SUBJECTS EXPOSED TO CHRONIC OCCUPATIONAL HYDRARGYRISM HAZARDS.
17737 APTIC NO. 35767

CLARK D L
SIGNIFICANCE OF ATMOSPHERIC DUST AND ICE RAFTING FOR ARCTIC OCEAN SEDIMENT.
17633 APTIC NO. 35928

CLARK G E
A TOTAL-SYSTEM VIEW OF ENVIRONMENTAL MANAGEMENT.
17862 APTIC NO. 35385

CLAYTON B E
LEAD POISONING IN CHILDREN.
17756 APTIC NO. 35462

CLINE E L
APPARATUS AND METHOD FOR ANALYZING ENGINE EXHAUST GAS.
*17451 APTIC NO. 35553

CLODMAN J
VISIBILITY DETERIORATION ASSOCIATED WITH OPERATIONS OF JET AIRCRAFT.
*17596 APTIC NO. 35575

CLOUGH W S
THE BEHAVIOUR IN THE ATMOSPHERE OF THE AEROSOL FROM A SODIUM FIRE.
*17597 APTIC NO. 35226

COATES N H
FLUID BED COMBUSTION. SUITABILITY OF COALS AND BED MATERIALS.
17129 APTIC NO. 35292

COBURN D R
A STUDY OF ABSORPTION AND RETENTION OF LEAD IN WILD WATERFOWL IN RELATION TO CLINICAL EVIDENCE OF LEAD POISONING.
*17792 APTIC NO. 35397

COLLINS A
THE DETERMINATION OF AMINOKETONES IN BIOLOGICAL FLUIDS.
17752 APTIC NO. 35620

COLON A A
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

COMMINS B T
TOXIC GASES IN TOWER SILOS.
*17544 APTIC NO. 35501

COMPHER A B
A FLUORESCENT SOURCE NDIR CARBON MONOXIDE ANALYZER.
17490 APTIC NO. 35167

CONFER R G
VARIABILITY OF OXIDANT LEVELS AT MONITORING STATIONS 100 FEET APART.
*17452 APTIC NO. 35309

CONNERS E
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

COOKE N E
POLLUTION CONTROL AT A LARGER FERTILIZER COMPLEX.
*17058 APTIC NO. 35985

COOPER H B H JR
CONTINUOUS SOURCE MONITORING OF GASEOUS SULFUR COMPOUNDS IN THE PAPER INDUSTRY.
*17453 APTIC NO. 35243

SOURCE TESTING FOR AIR POLLUTION CONTROL.
*17454 APTIC NO. 35956

COOPER R M
POLLUTION CONTROL AT A LARGER FERTILIZER COMPLEX.
17058 APTIC NO. 35985

COPE B H
SOME TECHNIQUES FOR ESTIMATING THE RESULTS OF THE EMISSION OF RADIOACTIVE EFFLUENTS FROM ORNL STACKS.
17586 APTIC NO. 35433

COQ J
ACTION BY THE FRENCH GAS INDUSTRY.
*17059 APTIC NO. 35061

CORBEIL R J
NITROGEN OXIDES IN THE EXHAUST OF METHANE FUELED AUTOMOBILES.
17118 APTIC NO. 35318

COREY R C
TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD).
17515 APTIC NO. 35727

CORMIS L D
TEN YEARS OF A STUDY ON THE EFFECT OF AIR POLLUTION ON PLANTS.
*17793 APTIC NO. 35196

CORN M
ADHERENCE ON INLET CONDITIONS FOR SELECTED AEROSOL SAMPLING INSTRUMENTS TO SUGGESTED CRITERIA.
17438 APTIC NO. 35122

RESIDENCE TIME OF PARTICLES IN URBAN AIR.
17603 APTIC NO. 35495

PERFORMANCE OF RESPIRABLE DUST SAMPLERS WITH FIBROUS DUST.
17439 APTIC NO. 35976

CORNELIUS J F
PHOTOFRAGMENT SPECTROMETER.
17447 APTIC NO. 35179

CORTES ALICEA M
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

COSTAS R JR
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

COSTONIS A C
EFFECTS OF AMBIENT SULFUR DIOXIDE AND OZONE ON EASTERN WHITE PINE IN A RURAL ENVIRONMENT.
*17794 APTIC NO. 35869

COTE W A
INDOOR/OUTDOOR AIR POLLUTANT RELATIONSHIPS FOR AIR-CONDITIONED BUILDINGS.
17409 APTIC NO. 35540

COURBON P
DEVICE FOR THE CONTINUOUS DETECTION OF DUST IN THE ATMOSPHERE.
*17455 APTIC NO. 35288

COWLEY J M
APPLICATIONS OF A HIGH-VOLTAGE TRANSMISSION SCANNING ELECTRON MICROSCOPE.
*17456 APTIC NO. 35457

COX L A
AN ASSESSMENT OF SOME SULFUR-FREE CHEMICAL PULPING PROCESSES.
*17060 APTIC NO. 35066

CRAIG C D
REPORT ON THE FEASIBILITY AND ADVISABILITY OF DEVELOPING A BALLOON-BORNE ELECTRICAL AEROSOL PARTICLE COUNTING AND SIZE DISTRIBUTION MEASURING SYSTEM.
*17457 APTIC NO. 35183

CRALLEY L J
ELECTROMOTIVE PHENOMENON IN METAL AND MINERAL PARTICULATE EXPOSURES. RELEVANCE TO EXPOSURE TO ASBESTOS AND OCCURRENCE OF CANCER.
*17722 APTIC NO. 35883

CRAMER J
KINETIC MODEL OF PHOTOCHEMICAL SMOG FORMATION.
17610 APTIC NO. 35075

CRANE R A
AUTO EXHAUST – LEAD VS AROMATICS.
17127 APTIC NO. 35123

CRANFORD J M
OVERHEAD CLEANING EQUIPMENT - ELIMINATION OF ELECTRICAL PROBLEMS.
*17217 APTIC NO. 35699

CREBBS T C
ENVIRONMENTAL DATA BASE FOR REGIONAL STUDIES IN THE HUMID TROPICS. (FINAL REPORT).
*17545 APTIC NO. 35392

CROCKER T T
ENZYMATIC CONVERSION OF BENZO(A)PYRENE. HYDROXYLATION VS DNA Binding.
17777 APTIC NO. 35345

CROMPTON D
ESTIMATING THE IMPACT OF TRAFFIC ON THE ENVIRONMENT.
*17061 APTIC NO. 36012

CROSS F L JR
ENVIRONMENTAL ASPECTS OF SITE SELECTION FOR A PETROLEUM REFINERY.
*17062 APTIC NO. 35887
AIR POLLUTION CONTROL.
*17218 APTIC NO. 35995

CRUM R G
A TOTAL-SYSTEM VIEW OF ENVIRONMENTAL MANAGEMENT.
17862 APTIC NO. 35385

CRUZ VIDAL M
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

CULKOWSKI W M
METEOROLOGICAL BEHAVIOR OF COMBUSTION PRODUCTS RELEASED AT THE BLANCO PLANT.
*17598 APTIC NO. 35208

D

DAIGO K
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) – DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

DALY C
AIR POLLUTION AND CAUSES OF DEATH.
*17723 APTIC NO. 35468

DAMON E K
PHOTOOXIDATION OF SULFUR DIOXIDE.
17649 APTIC NO. 35856

DARBY D A
SIGNIFICANCE OF ATMOSPHERIC DUST AND ICE RAFTING FOR ARCTIC OCEAN SEDIMENT.
17633 APTIC NO. 35928

DAVE J M
SHORT-TERM AIR QUALITY SURVEYS IN 4 MAJOR CITIES OF INDIA.
17573 APTIC NO. 35534

DAVIES D J I
DESTRUCTION OF NON-UNIFORM ORGANIC REFINERY WASTES.
*17063 APTIC NO. 35901

DAVIS H V
COLLAGEN BIOSYNTHESIS IN RAT LUNGS DURING EXPOSURE TO ASBESTOS.
*17724 APTIC NO. 35308

DAVIS R F
COMPOSITION OF DIESEL EXHAUST GAS.
17068 APTIC NO. 35590

DAVIS R J
THE FUNCTION OF CONDENSING STEAM IN AEROSOL SCRUBBERS.
17386 APTIC NO. 35304

DAYTON S
WET SCRUBBING OF WEAK SO2 GETS A TRIAL AT NEW MCGILL PILOT PLANT.
*17219 APTIC NO. 35295

DEANE M
OUTDOOR WORKERS IN THE UNITED STATES AND EUROPE.
17738 APTIC NO. 35668

DECKER C E
FIELD EVALUATION OF SULFUR DIOXIDE MONITORING INSTRUMENTS.
17524 APTIC NO. 35191

DECKER R R
APPLYING A NEW METHOD FOR MEASURING BENZO(A)PYRENE IN VEHICLE EXHAUST TO THE STUDY OF FUEL FACTORS.
17078 APTIC NO. 35919

DENNIS R
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

DERGACHEV N F
PREVENTION OF DEPOSIT FORMATION IN SCRUBBERS.
*17220 APTIC NO. 35945

DERIAGIN B V
THEORY OF THE MOTION OF MODERATELY COARSE VOLATILE AEROSOL PARTICLES IN HETEROGENEOUS GASES.
*17674 APTIC NO. 35132

DESCOLAS J
ACTION OF BUILDERS OF SEPARATORS AND OF SCRUBBERS.
*17221 APTIC NO. 35115

DETWILLER J
CENTENNIAL EVOLUTION OF THE CLIMATE OF PARIS. THE INFLUENCE OF ITS URBANIZATION.
*17599 APTIC NO. 35222

DHURANDHAR R
THE EFFECT OF AIR POLLUTANTS ON THE EYE. II. A STUDY OF THEIR EFFECT ON THE OCULOCARDIAC REFLEX.
17710 APTIC NO. 35486

DICKTER W
INVESTIGATION OF A DEVICE USING RADIATION TO CHARGE AND COLLECT PARTICULATE MATTER.
*17222 APTIC NO. 36015

DIXIT S N
SHORT-TERM AIR QUALITY SURVEYS IN 4 MAJOR CITIES OF INDIA.
17573 APTIC NO. 35534

DMITRIEV M T
SEPARATE DETERMINATION OF NITROGEN OXIDES IN THE ATMOSPHERE.
*17458 APTIC NO. 35129
THE PHYSICOCHEMICAL MECHANISM OF OZONE AND PHOTOOXIDANTS FORMATION IN THE ATMOSPHERE.
*17600 APTIC NO. 35987

DODDS E C
TETRA-ETHYL LEAD POISONING.
17718 APTIC NO. 35559

DODSON M
APPARATUS AND METHOD FOR EXHAUST ANALYSIS.
*17459 APTIC NO. 35302

DOERR K H
DEVICE FOR THE TREATMENT OF GASEOUS MEDIA.
17243 APTIC NO. 35884

DOMENICI F
EXPERIMENTAL STUDIES OF MODES OF ABSORPTION IN MERCURY VAPOR INTOXICATION0
*17725 APTIC NO. 35454

DONOHUE J J
POLYNUCLEAR AROMATICS IN AUTOMOBILE EXHAUST.
17124 APTIC NO. 35818

DOOLEY A E
TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD).
17515 APTIC NO. 35727

DOROSHENKO V N
THE EFFECT OF OROGRAPHY ON THE CHARACTERISTICS OF THE AIR FLOW WITHIN THE AERODYNAMIC TUBE.
17664 APTIC NO. 35421

DORSTEWITZ U
SOLID WASTE, WATER, AIR. WHAT ARE WE GOING TO BE CONFRONTED WITH? (Abfall, Wasser, Luft. Was kommt auf uns zu?) Text in German. Umwelt (Duesseldorf), no. 5:35-42, Oct./Nov. 1971. 6 refs.
*17139 APTIC NO. 35276

MOBILE TEST VEHICLE MEASURES EXHAUST EMISSIONS ON THE ROAD.

*17064 APTIC NO. 35994

DOUGLAS J W B

AIR POLLUTION AND RESPIRATORY INFECTION IN CHILDREN.

*17726 APTIC NO. 35663

DOWDY W L

A TOTAL-SYSTEM VIEW OF ENVIRONMENTAL MANAGEMENT.

*17862 APTIC NO. 35385

DOXEY G

NOTE: SOME USES OF CALCIUM CHLORIDE AS AN ADDITIVE TO BOILER COALS.

*17223 APTIC NO. 35722

DRAVNIEKS A

GAS CHROMATOGRAPHIC STUDY OF AIR QUALITY IN SCHOOLS.

*17460 APTIC NO. 35541

DREHER J J

EFFECTS OF ELECTRIC FIELDS AND NEGATIVE ION CONCENTRATIONS ON TEST PILOTS.

17435 APTIC NO. 35156

DRINKER P

AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.

17229 APTIC NO. 35180

DRISCOLL D M

BASE LINES FOR MEASURING ADVERSE EFFECTS OF AIR POLLUTION: SOME EVIDENCE FOR WEATHER EFFECTS ON MORTALITY.

*17727 APTIC NO. 35120

DRISSEL G M

REMOVAL OF SO2 FROM POWER PLANT FLUE GASES USING THE ALKALIZED ALUMINA PROCESS. (FINAL REPORT).

*17224 APTIC NO. 35505

DRUZHININ A A

KINETIC METHODS OF ANALYZING ORGANIC COMPOUNDS.

*17461 APTIC NO. 35404

DUBOIS L

CONTINUOUS DETERMINATION OF CARBON MONOXIDE BY FRONTAL ANALYSIS.

*17462 APTIC NO. 35894

DUCE R A

LEAD AND BROMINE IN ATMOSPHERIC PARTICULATE MATTER ON OAHU, HAWAII.

17553 APTIC NO. 35725

GASEOUS BROMINE AND PARTICULATE LEAD, VANADIUM, AND BROMINE IN A POLLUTED ATMOSPHERE.

17562 APTIC NO. 35861

DUNNING J

VEGETATION INJURY FROM THE INTERACTION OF NITROGEN DIOXIDE AND SULFUR DIOXIDE.

17815 APTIC NO. 35192

DYMENT J

GENERATION OF A SODIUM CHLORIDE AEROSOL FOR IN-PLACE TESTING OF AIR FILTERS.

17444 APTIC NO. 35876

E

EASTLUND B J

ENERGY, WASTES AND THE FUSION TORCH.

*17225 APTIC NO. 35442

EDDY A

SIMULATION OF ECOLOGICAL SYSTEMS.

*17601 APTIC NO. 35567

EDMONDSON F

AUSTRALIAN SERVICE EXPERIENCE WITH POLLUTION OF HIGH VOLTAGE INSULATION.

17825 APTIC NO. 35479

EDWARDS R

THE POLYCHLOROBIPHENYLS, THEIR OCCURRENCE AND SIGNIFICANCE: A REVIEW.

*17728 APTIC NO. 35531

EGI K

HYDRODESULFURIZATION OF RESIDUAL OIL – LONG RUN TEST.

17293 APTIC NO. 36004

EGLIT M E

BIOLOGICAL ACTION OF LOW CONCENTRATIONS OF OZONE.

*17729 APTIC NO. 35671

EGOROVA T S

REFLEX REACTIONS OF AN ORGANISM UNDER THE EFFECT OF HF, NAF AND ALF3.

17763 APTIC NO. 35670

EHRLICH R

SEROLOGIC RESPONSE IN SQUIRREL MONKEYS EXPOSED TO NITROGEN DIOXIDE AND INFLUENZA VIRUS.

17730 APTIC NO. 35789

EICK H

INDUSTRIAL FIRING SYSTEMS.

*17065 APTIC NO. 35981

EILERTSEN D E

BERYLLIUM.

*17066 APTIC NO. 35417

EKE P W A

GAS AS AN ENGINE FUEL.

*17067 APTIC NO. 35376

ELDERFIELD H

DUST TRANSPORTED IN THE NORTH-EAST AND SOUTH-EAST TRADE WINDS IN THE ATLANTIC OCEAN.

17593 APTIC NO. 35536

ELLIOT M A

COMPOSITION OF DIESEL EXHAUST GAS.

*17068 APTIC NO. 35590

ELLIOTT L F

AIR POLLUTION FROM AGRICULTURE.

*17069 APTIC NO. 35564

ELSHOUT A J

THE INFLUENCE OF MGO ON CHEMICAL REACTIONS OF DEPOSITS IN THE HIGH TEMPERATURE SECTION OF OIL FIRED BOILERS.

*17226 APTIC NO. 35557

EMUKAI N

TELEPHONE EXCHANGE AIR PURIFICATION IN AN INDUSTRIAL DISTRICT.

17823 APTIC NO. 35096

ENGELHARDT H

GAS ANALYZER.

*17463 APTIC NO. 35514

ENGELS G

STATE OF THE ART OF DUST ELIMINATION IN FOUNDRIES.

*17227 APTIC NO. 35958

ENGLES G

THE NEW REGULATIONS REGARDING PROTECTION AGAINST EMISSIONS AND OCCUPATIONAL HAZARDS AND THEIR EFFECTS ON FOUNDRIES.

*17863 APTIC NO. 35675

ESCHENROEDER A Q

FURTHER DEVELOPMENT OF THE PHOTOCHEMICAL SMOG MODEL FOR THE LOS ANGELES BASIN. (FINAL REPORT).

*17602 APTIC NO. 35246

ESCHER E E

THE TRITILOG AND ITS APPLICATION TO CONTINUOUS MEASUREMENT OF SULFUR CONCENTRATION IN STREAMS. PART II. FIELD APPLICATIONS.

17433 APTIC NO. 35642

ESMEN N A

RESIDENCE TIME OF PARTICLES IN URBAN AIR.

*17603 APTIC NO. 35495

ESSENHIGH R H

EXPERIMENTAL BEHAVIOR OF WASTE COMBUSTION IN A TEST INCINERATOR.

17364 APTIC NO. 35566

EVANS J H

DETERMINATION OF MERCURY BY A COMBUSTION TECHNIQUE USING GOLD AS A COLLECTOR.

17431 APTIC NO. 35826

F

FAIRBAIRN A S

THE NATURAL HISTORY OF CHRONIC BRONCHITIS.

17762 APTIC NO. 35588

FALGOUT D

TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS).

17426 APTIC NO. 35728

MOBILE TEST VEHICLE MEASURES EXHAUST EMISSIONS ON THE ROAD.
*17064 APTIC NO. 35994

DOUGLAS J W B
AIR POLLUTION AND RESPIRATORY INFECTION IN CHILDREN.
*17726 APTIC NO. 35663

DOWDY W L
A TOTAL-SYSTEM VIEW OF ENVIRONMENTAL MANAGEMENT.
*17862 APTIC NO. 35385

DOXEY G
NOTE: SOME USES OF CALCIUM CHLORIDE AS AN ADDITIVE TO BOILER COALS.
*17223 APTIC NO. 35722

DRAVNIEKS A
GAS CHROMATOGRAPHIC STUDY OF AIR QUALITY IN SCHOOLS.
*17460 APTIC NO. 35541

DREHER J J
EFFECTS OF ELECTRIC FIELDS AND NEGATIVE ION CONCENTRATIONS ON TEST PILOTS.
17435 APTIC NO. 35156

DRINKER P
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

DRISCOLL D M
BASE LINES FOR MEASURING ADVERSE EFFECTS OF AIR POLLUTION: SOME EVIDENCE FOR WEATHER EFFECTS ON MORTALITY.
*17727 APTIC NO. 35120

DRISSEL G M
REMOVAL OF SO2 FROM POWER PLANT FLUE GASES USING THE ALKALIZED ALUMINA PROCESS. (FINAL REPORT).
*17224 APTIC NO. 35505

DRUZHININ A A
KINETIC METHODS OF ANALYZING ORGANIC COMPOUNDS.
*17461 APTIC NO. 35404

DUBOIS L
CONTINUOUS DETERMINATION OF CARBON MONOXIDE BY FRONTAL ANALYSIS.
*17462 APTIC NO. 35894

DUCE R A
LEAD AND BROMINE IN ATMOSPHERIC PARTICULATE MATTER ON OAHU, HAWAII.
17553 APTIC NO. 35725
GASEOUS BROMINE AND PARTICULATE LEAD, VANADIUM, AND BROMINE IN A POLLUTED ATMOSPHERE.
17562 APTIC NO. 35861

DUNNING J
VEGETATION INJURY FROM THE INTERACTION OF NITROGEN DIOXIDE AND SULFUR DIOXIDE.
17815 APTIC NO. 35192

DYMENT J
GENERATION OF A SODIUM CHLORIDE AEROSOL FOR IN-PLACE TESTING OF AIR FILTERS.
17444 APTIC NO. 35876

E

EASTLUND B J
ENERGY, WASTES AND THE FUSION TORCH.
*17225 APTIC NO. 35442

EDDY A
SIMULATION OF ECOLOGICAL SYSTEMS.
*17601 APTIC NO. 35567

EDMONDSON F
AUSTRALIAN SERVICE EXPERIENCE WITH POLLUTION OF HIGH VOLTAGE INSULATION.
17825 APTIC NO. 35479

EDWARDS R
THE POLYCHLOROBIPHENYLS, THEIR OCCURRENCE AND SIGNIFICANCE: A REVIEW.
*17728 APTIC NO. 35531

EGI K
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

EGLIT M E
BIOLOGICAL ACTION OF LOW CONCENTRATIONS OF OZONE.
*17729 APTIC NO. 35671

EGOROVA T S
REFLEX REACTIONS OF AN ORGANISM UNDER THE EFFECT OF HF, NAF AND ALF3.
17763 APTIC NO. 35670

EHRLICH R
SEROLOGIC RESPONSE IN SQUIRREL MONKEYS EXPOSED TO NITROGEN DIOXIDE AND INFLUENZA VIRUS.
17730 APTIC NO. 35789

EICK H
INDUSTRIAL FIRING SYSTEMS.
*17065 APTIC NO. 35981

EII ERTSEN D E
BERYLLIUM.
*17066 APTIC NO. 35417

EKE P W A
GAS AS AN ENGINE FUEL.
*17067 APTIC NO. 35376

ELDERFIELD H
DUST TRANSPORTED IN THE NORTH-EAST AND SOUTH-EAST TRADE WINDS IN THE ATLANTIC OCEAN.
17593 APTIC NO. 35536

ELLIOT M A
COMPOSITION OF DIESEL EXHAUST GAS.
*17068 APTIC NO. 35590

ELLIOTT L F
AIR POLLUTION FROM AGRICULTURE.
*17069 APTIC NO. 35564

ELSHOUT A J
THE INFLUENCE OF MGO ON CHEMICAL REACTIONS OF DEPOSITS IN THE HIGH TEMPERATURE SECTION OF OIL FIRED BOILERS.
*17226 APTIC NO. 35557

EMUKAI N
TELEPHONE EXCHANGE AIR PURIFICATION IN AN INDUSTRIAL DISTRICT.
17823 APTIC NO. 35096

ENGELHARDT H
GAS ANALYZER.
*17463 APTIC NO. 35514

ENGELS G
STATE OF THE ART OF DUST ELIMINATION IN FOUNDRIES.
*17227 APTIC NO. 35958

ENCLES G
THE NEW REGULATIONS REGARDING PROTECTION AGAINST EMISSIONS AND OCCUPATIONAL HAZARDS AND THEIR EFFECTS ON FOUNDRIES.
*17863 APTIC NO. 35675

ESCHENROEDER A Q
FURTHER DEVELOPMENT OF THE PHOTOCHEMICAL SMOG MODEL FOR THE LOS ANGELES BASIN. (FINAL REPORT).
*17602 APTIC NO. 35246

ESCHER E E
THE TRITILOG AND ITS APPLICATION TO CONTINUOUS MEASUREMENT OF SULFUR CONCENTRATION IN STREAMS. PART II: FIELD APPLICATIONS.
17433 APTIC NO. 35642

ESMEN N A
RESIDENCE TIME OF PARTICLES IN URBAN AIR.
*17603 APTIC NO. 35495

ESSENHIGH R H
EXPERIMENTAL BEHAVIOR OF WASTE COMBUSTION IN A TEST INCINERATOR.
17364 APTIC NO. 35566

EVANS J H
DETERMINATION OF MERCURY BY A COMBUSTION TECHNIQUE USING GOLD AS A COLLECTOR.
17431 APTIC NO. 35826

F

FAIRBAIRN A S
THE NATURAL HISTORY OF CHRONIC BRONCHITIS.
17762 APTIC NO. 35588

FALGOUT D
TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS).
17426 APTIC NO. 35728

FALK H L
AROMATIC POLYCYCLIC HYDROCARBONS IN POLLUTED AIR AS INDICATORS OF CARCINOGENIC HAZARDS.
*17464 APTIC NO. 35640

FALKENBERRY H L
SO2: MORE QUESTIONS THAN ANSWERS.
17369 APTIC NO. 35056

FAN L T
REVIEW OF ATMOSPHERIC DISPERSION AND URBAN AIR POLLUTION MODELS.
*17604 APTIC NO. 35045

FATTINGER V
SCRUBBER WITH DRIP CATCHER.
*17228 APTIC NO. 35145

FEENEY P J
SENSITIVITY VERSUS TARGET BACKINGS FOR ELEMENTAL ANALYSIS BY ALPHA EXCITED X-RAY FLUORESCENCE.
17465 APTIC NO. 35591

FELIBERTI M
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

FELT A E
ENGINES AND EFFECTS OF LEAD-FREE GASOLINE.
*17070 APTIC NO. 35199

FENNER D
POWER FROM THE EARTH.
*17071 APTIC NO. 35124

FENTERS J D
SEROLOGIC RESPONSE IN SQUIRREL MONKEYS EXPOSED TO NITROGEN DIOXIDE AND INFLUENZA VIRUS.
*17730 APTIC NO. 35789

FENTON A F
ATMOSPHERIC POLLUTION OF BELFAST AND ITS RELATIONSHIP TO THE LICHEN FLORA.
*17795 APTIC NO. 35190

FERRIS B G JR
USE OF PULMONAY FUNCTION TESTS IN EPIDEMIOLOGIC SURVEYS
*17731 APTIC NO. 35418

FETT W
EXTRAORDINARY CARBON MONOXIDE CONCENTRATIONS IN THE AIR OF MAJOR CITIES.
*17605 APTIC NO. 35357

FINDLAY J
SEROLOGIC RESPONSE IN SQUIRREL MONKEYS EXPOSED TO NITROGEN DIOXIDE AND INFLUENZA VIRUS.
17730 APTIC NO. 35789

FINE D H
NITRIC OXIDE FORMATION IN PREMIXED AND DIFFUSION FLAMES
17150 APTIC NO. 35214

FINKEL M P
THE PRODUCTION OF AN EMPHYSEMA-LIKE CONDITION IN RATS BY THE ADMINISTRATION OF PAPAIN AEROSOL (34750).
17736 APTIC NO. 35181

FIRST M W
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
*17229 APTIC NO. 35180

SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
*17675 APTIC NO. 35232

REMOVAL OF SOLUBLE GASES AND PARTICULATES FROM AIR STREAMS WITH SPECIAL REFERENCE TO FLUORIDES.
17196 APTIC NO. 35448

FISCHER H A
RESULTS OF DUST MEASUREMENTS IN CEMENT FURNACES.
17546 APTIC NO. 35155

FISCHER W H
PARTICLE PRODUCTION BY POLYMER PYROLYSIS: EFFECT OF CARBON MONOXIDE.
*17072 APTIC NO. 35786

FISHER E E
PROCESS FOR RECOVERING A METAL OXIDE AND SULFUR DIOXIDE FROM METAL SULFATE.
17209 APTIC NO. 35512

FLINT L R
THE COLLISION EFFICIENCY OF SMALL PARTICLES WITH SPHERICAL AIR BUBBLES.
*17230 APTIC NO. 35754

FLOCCHINI R G
SENSITIVITY VERSUS TARGET BACKINGS FOR ELEMENTAL ANALYSIS BY ALPHA EXCITED X-RAY FLUORESCENCE.
*17465 APTIC NO. 35591

FLYGER H
TRACER EXPERIMENTS FOR THE VALUATION OF THE PARTICLE-FILTRATION EFFICIENCY OF INSTALLED ABSOLUTE FILTERS.
*17231 APTIC NO. 35408

FOLMAN M
MICROWAVE ABSORPTION AND POTENTIAL BARRIER FOR ORIENTATION. SULFUR DIOXIDE ADSORBED ON SODIUM CHLORIDE AND POTASSIUM CHLORIDE.
17348 APTIC NO. 35069

FOMINA S A
SEPARATE DETERMINATION OF NITROGEN OXIDES IN THE ATMOSPHERE.
17458 APTIC NO. 35129

FONTANGES R
PURIFICATION OF ATMOSPHERIC POLYCYCLIC AROMATIC HYDROCARBONS BY THIN LAYER CHROMATOGRAPHY.
17450 APTIC NO. 35131

FOWLER D G
POLLUTION CONTROL AND ECONOMICS.
*17832 APTIC NO. 35335

FRADEL M A
ENVIRONMENTAL DATA BASE FOR REGIONAL STUDIES IN THE HUMID TROPICS. (FINAL REPORT).
17545 APTIC NO. 35392

FRANKEL R J
ENVIRONMENTAL QUALITY CONSIDERATIONS IN PLANNING THE FUTURE OF THE COAL-ELECTRIC POWER INDUSTRY.
*17864 APTIC NO. 36023

FREDINBURG R R
TIMED MOTORIZED FLUE CLEANING APPARATUS.
17405 APTIC NO. 35301

FREEMAN R
REVERSIBLE MYOCARDITIS DUE TO CHRONIC LEAD POISONING IN CHILDHOOD.
*17 32 APTIC NO. 35463

FREIDAY J H
CHEMICAL RECOVERY FURNACE WITH AIR CASCADE EVAPORATORY SYSTEM.
*17232 APTIC NO. 35315

FREVEL L K
METHOD OF REMOVING SULFUR DIOXIDE AND PARTICULATE MATTER FROM GASEOUS STREAMS.
*17233 APTIC NO. 35717

FRIEDLANDER S
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

FRIEDLANDER S K
THE CHARACTERIZATION OF AEROSOLS DISTRIBUTED WITH RESPECT TO SIZE AND CHEMICAL COMPOSITION -- II. CLASSIFICATION AND DESIGN OF AEROSOL MEASURING DEVICES.
*17466 APTIC NO. 35488

FRIEDRICH F D
EFFECT OF FUEL CHARACTERISTICS AND EXCESS COMBUSTION AIR ON SULPHURIC ACID FORMATION ON A PULVERIZED-COAL-FIRED BOILER.
17108 APTIC NO. 35338

CONTROL OF SO3 IN LOW-PRESSURE HEATING BOILERS BY AN ADDITIVE.
17304 APTIC NO. 35721

FROHLIGER J O
TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS).
17426 APTIC NO. 35728

FUJINO T
SURVEY ON MORBIDITY, MORTALITY, MEDICAL EXAMINATION OF THE RESIDENTS, AND MEDICAL EXAMINATION OF SCHOOL CHILDREN AND APPROVED

VICTIMS OF ENVIRONMENTAL HAZARD.
*17733 APTIC NO. 35099

FUJINUMA S
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

FUJITA A
NEUTRON ACTIVATION ANALYSIS OF AIRBORNE DUST.
17560 APTIC NO. 35828

FUJITANI Y
AIR POLLUTION: MEASUREMENT AND CONTROL MEASURE.
*17865 APTIC NO. 35922

FUKAYA K
HYGIENIC CHEMICAL STUDIES ON PUBLIC HAZARDS BY HARMFUL SUBSTANCES. IV. ATOMIC ABSORPTION PHOTOMETRIC DETERMINATION OF LEAD IN GASOLINE.
17143 APTIC NO. 36006

FUKUI S
HYGIENIC CHEMICAL STUDIES ON PUBLIC HAZARDS BY HARMFUL SUBSTANCES. IV. ATOMIC ABSORPTION PHOTOMETRIC DETERMINATION OF LEAD IN GASOLINE.
17143 APTIC NO. 36006

FULTON M
NEW FACTORS IN PLANT LOCATION.
*17866 APTIC NO. 35088

FUMICH G
COAL RESEARCH FOCUSES ON NEW TECHNIQUE.
*17234 APTIC NO. 35659

FUNABASHI S
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
*17734 APTIC NO. 35154

FUNKE G
RESULTS OF DUST MEASUREMENTS IN CEMENT FURNACES.
*17546 APTIC NO. 35155

FURUTA Y
MANAGEMENT OF PATIENTS RECOGNIZED BY THE ENVIRONMENTAL POLLUTION RELIEF LAW DISEASE OF YOKKAICHI CITY ASSOCIATED WITH AIR POLLUTION.
17774 APTIC NO. 35109

FUSE Y
TEST OF SMOKE DEVELOPEMENT FROM SYNTHETIC MATERIALS USED FOR RAILWAY VEHICLES.
17101 APTIC NO. 35459

FUZITA Y
DETERMINATION OF CARBON MONOXIDE IN THE ATMOSPHERE.
*17467 APTIC NO. 35157

G

GAGLIARDI J C
EFFECTS OF NON-LEADED FUELS ON EXHAUST HYDROCARBON COMPOSITION AND CATALYST LIFE.
*17073 APTIC NO. 35353

GALOIAN V S
THEORY OF THE MOTION OF MODERATELY COARSE VOLATILE AEROSOL PARTICLES IN HETEROGENEOUS GASES.
17674 APTIC NO. 35132

GALUSKINOVA V
THREE, FOUR-BENZPYRENE DETERMINATION IN THE SMOKY ATMOSPHERE OF SOCIAL MEETING ROOMS AND RESTAURANTS. A CONTRIBUTION TO THE PROBLEM OF THE NOXIOUSNESS OF SO-CALLED PASSIVE SMOKING.
*17074 APTIC NO. 35249

GANJE T J
LEAD QUANTITIES IN PLANTS, SOIL, AND AIR NEAR SOME MAJOR HIGHWAYS IN SOUTHERN CALIFORNIA.
17812 APTIC NO. 35827

GARCIA PALMIERI M R
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
*17735 APTIC NO. 35164

GARLAND J A
THE BEHAVIOUR IN THE ATMOSPHERE OF THE AEROSOL FROM A SODIUM FIRE.
17597 APTIC NO. 35226

GARRETT E E
ENVIRONMENTAL DATA BASE FOR REGIONAL STUDIES IN THE HUMID TROPICS. (FINAL REPORT).
17545 APTIC NO. 35392

GARROD D J
A SURVEY OF MEASUREMENT AND CONTROL OF POLLUTANTS.
*17235 APTIC NO. 35736

GATHMAN S G
CHARGE TRANSPORT THROUGH AN AEROSOL CLOUD.
17681 APTIC NO. 35267

GAUGER G W
ENVIRONMENTAL DATA BASE FOR REGIONAL STUDIES IN THE HUMID TROPICS. (FINAL REPORT).
17545 APTIC NO. 35392

GAVELIN G
AIR AND WATER POLLUTION REGULATIONS AND CONTROLS IN SWEDEN.
Paper Trade J., 156(2):38-39, Jan. 10, 1972.
*17867 APTIC NO. 35817

BIONICS AS APPLIED TO ANALYTICAL RESEARCH.
*17468 APTIC NO. 35182

GELBOIN H V
ENZYMATIC HYDROXYLATION OF BENZOPYRENE AND ITS RELATIONSHIP TO CYTOTOXICITY.
*17676 APTIC NO. 35639

GENY M
PROBLEMS OF AIR AND WATER POLLUTION ENGENDERED BY THE STEEL INDUSTRY.
*17868 APTIC NO. 35626

GENY P
ACTION IN THE IRON AND STEEL INDUSTRY.
*17236 APTIC NO. 35092

GEORGIEVSKY YU S
ON DAILY AND SEASONAL VARIATIONS OF CO2 CONTENT IN THE NEAR GROUND LAYER OF THE ATMOSPHERE.
*17547 APTIC NO. 35761

GEORGIEY K
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

GERBER A F
SOME EFFECTS OF EXHAUST GAS RECIRCULATION UPON AUTOMOTIVE ENGINE INTAKE SYSTEM DEPOSITS AND CRANKCASE LUBRICANT PERFORMANCE.
*17237 APTIC NO. 35689

GEX V E
REMEDIAL MEASURES IN AIR POLLUTION WHICH HAVE BEEN TAKEN BY AN INDUSTRY, INCLUDING A DISCUSSION OF COSTS.
*17238 APTIC NO. 35705

GIALELLA R M
REMOVAL OF SO2 FROM POWER PLANT FLUE GASES USING THE ALKALIZED ALUMINA PROCESS. (FINAL REPORT).
17224 APTIC NO. 35505

GIBSON H J
MEETING FUTURE EMISSION STANDARDS WITH LEADED FUELS.
17178 APTIC NO. 35778

GILBERT D
ESTIMATING THE IMPACT OF TRAFFIC ON THE ENVIRONMENT.
17061 APTIC NO. 360[illegible]

GILBERT R E
THE CONTRIBUTION OF INDUSTRY TO NEBRASKA S POLLUTION.
*17075 APTIC NO. 35563

GILBERT R R
FLYWHEEL FEASIBILITY STUDY AND DEMONSTRATION. (FINAL REPORT).
*17076 APTIC NO. 35445

GILES R E
THE PRODUCTION OF AN EMPHYSEMA-LIKE CONDITION IN RATS BY THE ADMINISTRATION OF PAPAIN AEROSOL (34750).
*17736 APTIC NO. 35181

GILLETTE D A
A STUDY OF AGING OF LEAD AEROSOLS.
*17606 APTIC NO. 35207

GILLIAM A G
LUNG CANCER MORTALITY. GEOGRAPHIC DISTRIBUTION IN THE UNITED STATES FOR 1948-1949.
17742 APTIC NO. 35600

GILLILAND J C
URINARY LEAD-210 AS INDEX OF MINE RADON EXPOSURE.
17712 APTIC NO. 35382

GILMORE F R
POSSIBLE EFFECTS OF ATMOSPHERIC PARTICLES ON FIREBALL EMISSIONS.
17637 APTIC NO. 35610

GIULIANO G
INVESTIGATION OF MERCURY IN THE CEREBROSPINAL FLUID OF SUBJECTS EXPOSED TO CHRONIC OCCUPATIONAL HYDRARGYRISM HAZARDS.
*17737 APTIC NO. 35767

GLASSON G T
AUSTRALIAN SERVICE EXPERIENCE WITH POLLUTION OF HIGH VOLTAGE INSULATION.
17825 APTIC NO. 35479

GODZIK S
ABSORPTION OF 35-S02 AND ITS LOCALIZATION IN THE LEAVES OF CERTAIN TREES.
*17796 APTIC NO. 35254
ESTIMATION OF AIR POLLUTION IN FORESTS OF CENTRAL PART OF KATOWICE DISTRICT AND THE WESTERN PART OF KRAKOW DISTRICT.
*17548 APTIC NO. 35658

GOERZ H
PARTICLE SIZE DISTRIBUTIONS OF PARTICULATE ALUMINAS FROM COMPUTER-PROCESSED SEM IMAGES.
17529 APTIC NO. 35571

GOLD R
DETECTION OF AIR-BORNE BERYLLIUM DUST. (FINAL REPORT).
*17469 APTIC NO. 35161
BERYLLIUM-HAZARD DETECTION USING POLONIUM-210 ALPHAS.
*17470 APTIC NO. 35162

GOLDBERG E D
ATMOSPHERIC SULFUR AND FOSSIL FUEL COMBUSTION.
17104 APTIC NO. 35788

GOLDBERGA M S
MAXIMUM PERMISSIBLE CONCENTRATIONS OF NOXIOUS SUBSTANCES IN THE ATMOSPHERIC AIR OF POPULATED AREAS.
17844 APTIC NO. 35406

GOLDHAFT T M
A METHOD FOR THE TREATMENT OF ANIMAL WASTES TO CONTROL AMMONIA AND OTHER ODORS.
17131 APTIC NO. 35673

GOLDIN A S
SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

GOLDSMITH J R
OUTDOOR WORKERS IN THE UNITED STATES AND EUROPE.
*17738 APTIC NO. 35668

GOLIKOV V I
ON THE CHARACTERISTICS OF A V. G. FESENKOV ACTINOMETER.
*17471 APTIC NO. 35452

GOLSER L
SEPARATION OF BROMINE FROM GASEOUS MIXTURES CONTAINING OXIDES OF NITROGEN.
*17677 APTIC NO. 35299

GOMEZ R J
APPARATUS AND METHOD FOR EXHAUST ANALYSIS.
17459 APTIC NO. 35302

GOODSEL A J
REACTIONS OF GASEOUS POLLUTANTS WITH SOLIDS. I. INFRARED STUDY OF THE SORPTION OF SO2 ON CAO.
17309 APTIC NO. 35762

GORDON G M
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
17180 APTIC NO. 35478

GORMEL B
CONTROL OF ODORS THROUGH MANURE MANAGEMENT.
17310 APTIC NO. 35879

GORNISIEWICZ S
COMPUTATION OF GAS FLOW RATES THROUGH A FILTER TISSUE TAKING INTO ACCOUNT THE BLOWER AND TRANSMISSION PARAMETERS.
*17239 APTIC NO. 35975

GOSTEMINSKAYA T Y
A SPECTROCHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF MICROCONTAMINANTS IN GASES.
17520 APTIC NO. 35327

GOUGH W C
ENERGY, WASTES AND THE FUSION TORCH.
17225 APTIC NO. 35442

GOULDING F S
TRACE ELEMENT ANALYSIS BY X-RAY FLUORESCENCE.
*17472 APTIC NO 35401

GOULET R T
FILTER.
*17240 APTIC NO. 35733

GOURDINE M C
TURBULENCE INDUCING ELECTROGASDYNAMIC PRECIPITATOR.
*17241 APTIC NO. 35499

GRANDJEAN J
AIR POLLUTION BY SMOKE AND SO2.
17542 APTIC NO. 35422
PRINCIPLES AND METHODS OF STUDY OF THE ENVIRONMENT IN BELGIUM
17860 APTIC NO. 35701

GRANTHAM L F
REMOVAL OF LEAD FROM GASES WITH MOLTEN ALKALI METAL CARBONATES.
*17242 APTIC NO. 35352

GRAVES H B JR
SOME EFFECTS OF AIR-BORNE FLUORINE ON GROWTH AND YIELD OF SIX CITRUS VARIETIES.
17807 APTIC NO. 35896

GRAVESS H B JR
SOME EFFECTS OF AIR-BORNE FLUORINE ON GROWTH AND YIELD OF SIX CITRUS VARIETIES
17806 APTIC NO. 35576

GRAY A W
LEGAL ASPECTS OF AIR POLLUTION.
*17869 APTIC NO. 35694

GREENBERG J H
SYSTEMS ANALYSIS OF EMISSIONS -- THE IRON FOUNDRY INDUSTRY.
*17077 APTIC NO. 35925

GRENNFELT P
GAS CHROMATOGRAPHIC ANALYSIS OF GASEOUS SULFUR COMPOUNDS IN THE ATMOSPHERE.
*17473 APTIC NO. 35949

GRESZTA J
THE INFLOW OF AIR POLLUTION UPON THE GROWTH OF A COMMON PINE-TREE AND A BLACK PINE-TREE.
*17797 APTIC NO. 35259
ESTIMATION OF AIR POLLUTION IN FORESTS OF CENTRAL PART OF KATOWICE DISTRICT AND THE WESTERN PART OF KRAKOW DISTRICT.
17548 APTIC NO. 35658

GRIFFIN J J
DUST TRANSPORTED IN THE NORTHEAST AND SOUTH-EAST TRADE WINDS IN THE ATLANTIC OCEAN
17593 APTIC NO. 35536

GRIFFING M E
AROMATIC ALDEHYDES AND PHENOLS IN THE EXHAUST FROM LEADED AND UNLEADED FUELS.
17086 APTIC NO. 35477
APPLYING A NEW METHOD FOR MEASURING BENZO(A)PYRENE IN VEHICLE EXHAUST TO THE STUDY OF FUEL FACTORS.
*17078 APTIC NO. 35919

GRIMM H
DEVICE FOR THE TREATMENT OF GASEOUS MEDIA.
*17243 APTIC NO. 35884

GROSICK H A
SYSTEM FOR THE REMOVAL OF NAPHTHALENE FROM COKE OVEN GAS.
*17244 APTIC NO. 35503

GROSSER P J
VITAL CAPACITY AND FORCED INSPIRATION TEST IN SCHOOL CHILDREN OF THE FOURTH AND FIFTH GRADE FROM AREAS WITH DIFFERENT AIR HYGIENE CONDITIONS.
*17739 APTIC NO. 35968

GROSSSTUECK W
PROCESS FOR THE MANUFACTURE OF SEPARATION NOZZLES AND THE SEPARATION NOZZLE MADE IN ACCORDANCE WITH THE PROCESS.
17399 APTIC NO. 35325

GUEHO B J
AIR POLLUTION FROM HOT MIX PLANTS.
17543 APTIC NO. 35227

GUINEE V F
EPIDEMIOLOGY OF LEAD POISONING IN NEW YORK CITY - 1970.
17768 APTIC NO. 35587

GUREVICH N A
ESTIMATE OF THE INFLUENCE OF VARIOUS GAS EJECTION SOURCES ON POLLUTION IN THE ATMOSPHERE.
17650 APTIC NO. 35565

GURIEV V S
THE STUDY OF VELOCITY FIELDS IN A VORTEX DUST COLLECTOR.
17392 APTIC NO. 35543

GURVICH A S
MEASUREMENT OF THE AVERAGE STRUCTURAL CHARACTERISTIC OF THE ATMOSPHERIC REFRACTIVE INDEX.
17619 APTIC NO. 35700

GUTMAN D
ELECTRON AFFINITIES OF 02, 03, NO, NO2, NO3 BY ENDOTHERMIC CHARGE TRANSFER.
17668 APTIC NO. 35063

GUTOW B S
AN INVENTORY OF IRON FOUNDRY EMISSIONS.
*17079 APTIC NO. 35897

H

HAAS VOLKMANN E
DEVICE FOR DETOXIFICATION OF EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES.
*17245 APTIC NO. 35104
METHOD AND DEVICE FOR SECONDARY COMBUSTION OF EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES
*17246 APTIC NO. 35510

HAEUSLER A
BUTANE, A NEW FUEL FOR ASPHALT MIXING PLANTS.
*17080 APTIC NO. 35980

HAGEN M F
ION PUMP POWER SUPPLY. VOLUME 3 OF 6 FOR COMBINED STUDY PROGRAM. FINAL REPORT.
*17474 APTIC NO. 35399

HAGIWARA T
MEASURING APPARATUS FOR TOXIC GASES.
*17475 APTIC NO. 35737

HAIGH D H
EXPANSIVE IMBIBITION FOR PRACTICAL POLLUTION PARTICULATION, OR, SEPARATING THINGS FROM STUFF.
*17247 APTIC NO. 35709

HALES J M
FIELD INVESTIGATION OF SULFUR DIOXIDE WASHOUT FROM THE PLUME OF A LARGE COAL-FIRED POWER PLANT BY NATURAL PRECIPITATION. (FINAL REPORT).
*17607 APTIC NO. 35573

HALL F V
EXHAUST SYSTEM.
17397 APTIC NO. 35297

HALL H T
THE ROLE OF THE STEEL FOUNDRY INDUSTRY IN ENGENDERING BETTER STANDARDS OF HEALTH, SAFETY AND WELFARE IN STEEL FOUNDRIES.
*17081 APTIC NO. 35128

HALL R H
EXPANSIVE IMBIBITION FOR PRACTICAL POLLUTION PARTICULATION, OR, SEPARATING THINGS FROM STUFF.
17247 APTIC NO. 35709

HALL S K
POLLUTION AND POISONING.
*17740 APTIC NO. 35811

HALLEY J H
CURRENT SMELTING SYSTEMS AND THEIR RELATION TO AIR POLLUTION.
*17082 APTIC NO. 35224

HALLIDAY E C
DISCUSSIONS. A NUMERICAL EXPERIMENT IN SIMULATING THE TRANSPORT OF SULPHUR DIOXIDE THROUGH THE ATMOSPHERE.
*17608 APTIC NO. 35749

HAMADA M
IMPROVEMENTS ON MAINTENANCE OF AUTOMOTIVE EXHAUST GAS MEASURING APPARATUS.
*17476 APTIC NO. 35732

HAMANO Y
THE EXHAUST GAS ANALYSIS OF THE AUTOMOTIVE ENGINE EQUIPPED WITH THE LATEST ELECTRIC IGNITION SYSTEM. REPORT 1. THE ANALYSIS OF GAS UNDER NO LOAD.
17353 APTIC NO. 35807

HAMBLIN R J J
I-C ENGINE EXHAUST GAS AFTERBURNER AIR CONTROL.
*17248 APTIC NO. 35300

HAMMER J
METHOD AND INSTRUMENT FOR THE MEASUREMENT OF TRACES OF GASES AND OF VAPORS IN A GASEOUS MEDIUM.
*17477 APTIC NO. 35363

HAMMJE K
THE TASKS OF THE PUBLIC HEALTH SYSTEM OF THE GERMAN DEMOCRATIC REPUBLIC IN THE FIELD OF THE HYGIENE OF THE AIR.
*17870 APTIC NO. 35628

HAMMOND P B
STUDIES WITH CALCIUM ETHYLENEDIAMINETETRAACETATE IN CALVES: TOXICITY AND USE IN BOVINE LEAD POISONING.
17786 APTIC NO. 35209

HAMRICK T P
SOME TECHNIQUES FOR ESTIMATING THE RESULTS OF THE EMISSION OF RADIOACTIVE EFFLUENTS FROM ORNL STACKS.
17586 APTIC NO. 35433

HANNA S R
A SIMPLE METHOD OF CALCULATING DISPERSION FROM URBAN AREA SOURCES.
*17609 APTIC NO. 35497

HARDISON J R
CHEMICAL CONTROL OF DISEASES OF GRASS SEED CROPS.
*17678 APTIC NO. 35175

HARDISON L C
GAS-LIQUID SCRUBBING TOWER.
*17249 APTIC NO. 35519

HARIHARAN T A
STUDIES ON TECHNIQUES FOR SATELLITE SURVEILLANCE OF GLOBAL ATMOSPHERIC POLLUTION. (FINAL REPORT).
17497 APTIC NO. 35713

HARRISON D
ONTARIO HYDRO S AIR-POLLUTION-CONTROL RESEARCH PROGRAM.
*17871 APTIC NO. 36022

HARRISON P R
TIME VARIATIONS OF LEAD, COPPER AND CADMIUM CONCENTRATIONS IN AEROSOLS IN ANN ARBOR, MICHIGAN.
*17549 APTIC NO. 35489

HARRISON R
DESTRUCTION OF NON-UNIFORM ORGANIC REFINERY WASTES.
17063 APTIC NO. 35901

HART W E
APPARATUS FOR IGNITING AND BURNING AIR-BORNE PARTICULATE COMBUSTIBILE MATERIAL.
*17250 APTIC NO. 35525

HARTFORD W
CHEMICAL RECOVERY FURNACE WITH AIR CASCADE EVAPORATORY SYSTEM.
17232 APTIC NO. 35315

HARVEY J R
FLYWHEEL FEASIBILITY STUDY AND DEMONSTRATION. (FINAL REPORT).
17076 APTIC NO. 35445

HASEGAWA T
TRACE METALS IN AIR BORNE PARTICULATES. I. SURVEY OF LEAD IN THE ATMOSPHERE.
*17550 APTIC NO. 36009

HASHIMOTO A
STUDY OF EARLY RECOVERY IN SMOKE DAMAGED AREAS. II. POLICY IN THE SMOKE-DENUDED AREA IN ASHIO (CENTRAL HONSHU).
17805 APTIC NO. 35388

HASS G C
SOURCE TESTING OF MOTOR VEHICLES.
*17478 APTIC NO. 35265

HAUSER E W
FUNDAMENTAL AIR POLLUTION CONSIDERATIONS FOR URBAN AND TRANSPORTATION PLANNERS.
*17872 APTIC NO. 35850

HAYAKAWA T
THE EFFECT OF THE TEMPERATURE OF WATER COOLED GASOLINE ENGINE ON THE AMOUNT OF CO IN EXHAUST GAS.
*17251 APTIC NO. 35768

HAYASHI T
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT I. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

HAYNIE F H
EFFECT OF ATMOSPHERIC POLLUTANTS ON CORROSION BEHAVIOR OF STEELS.
*17821 APTIC NO. 35402

HAZBUN E A
KINETIC MODEL OF PHOTOCHEMICAL SMOG FORMATION.
*17610 APTIC NO. 35075

HECHT T A
DEVELOPMENT AND VALIDATION OF A GENERALIZED MECHANISM FOR PHOTOCHEMICAL SMOG.
*17611 APTIC NO. 35853

HECK W W
VEGETATION INJURY FROM THE INTERACTION OF NITROGEN DIOXIDE AND SULFUR DIOXIDE.
17815 APTIC NO. 35192
EFFECT OF LOW CONCENTRATIONS OF OZONE AND SULFUR DIOXIDE ON FOLIAGE, GROWTH AND YIELD OF RADISH.
17816 APTIC NO. 35929

HEINEN C M
WHERE ARE ALL THOSE GADGETS GOING? Preprint, Society of Automotive Engineers, Inc., New York, llp., 1971. 15 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Paper 710074.)
17252 APTIC NO. 35261
APPLICATION OF COMPUTER SIMULATION TECHNIQUES TO THE PREDICTION OF FLAME GAS EMISSIONS. THE EFFECTS OF ELECTRIC FIELDS ON FLAME PROPERTIES.
17683 APTIC NO. 35270

HELBIG B
DEVICE FOR THE SEPARATION OF SMALL DROPLETS, ESPECIALLY OF OIL FROM GASES AND VAPORS.
*17253 APTIC NO. 35530

HELBIG H S
BACKSCATTER STUDIES IN FOG USING LASER TECHNIQUES.
*17612 APTIC NO. 35630

HELLER A
PROPERTIES OF THE AIR.
*17083 APTIC NO. 35455

HEMEON W C L
GAS CLEANING EFFICIENCY REQUIREMENTS FOR DIFFERENT POLLUTANTS.
*17084 APTIC NO. 35638

HENDERSON R T
AUSTRALIAN SERVICE EXPERIENCE WITH POLLUTION OF HIGH VOLTAGE INSULATION.
17825 APTIC NO. 35479

HENSON C G
POLLUTION FROM BOILER STACKS AND ENGINE EXHAUSTS - THE CHEMISTRY OF AIR POLLUTION AND ITS SOLUTION BY THE PROFIT FACTOR.
*17254 APTIC NO. 35476

HENZ D J
THE RINGELMANN NUMBER AS AN IRREBUTABLE PRESUMPTION OF GUILT - AN OUTDATED CONCEPT.
*17873 APTIC NO. 35698

HERKHOF D
LARIMER COUNTY, COLORADO, AIR POLLUTION AND OUTLOOK.
17644 APTIC NO. 35368

HESTER J A
STUDY OF FLY ASH AS A MATERIAL FOR USE IN CONCETE.
*17679 APTIC NO. 35169

HEUER G E
FLYWHEEL FEASIBILITY STUDY AND DEMONSTRATION. (FINAL REPORT).
17076 APTIC NO. 35445

HEYWOOD J B
TIME-RESOLVED MEASUREMENTS OF HYDROCARBON MASS FLOW RATE IN THE EXHAUST OF A SPARK-IGNITION ENGINE.
17141 APTIC NO. 35580

HICKMAN J R
LEAD POISONING. POTTERY GLAZES, AN OFTEN IGNORED HAZARD.
*17741 APTIC NO. 35563

HIETBRINK E H
DUEL BATTERY ELECTRIC POWERPLANT.
*17085 APTIC NO. 35712

HILLIER I H
A THEORETICAL INTERPRETATION OF THE BONDING, AND THE PHOTOELECTRON AND ULTRA-VIOLET SPECTRA OF SULPHUR DIOXIDE.
*17680 APTIC NO. 35079

HIMI Y
AIR POLLUTION IN INDUSTRIAL CITIES.
*17551 APTIC NO. 35098
AIR POLLUTION IN INDUSTRIAL CITIES.
*17552 APTIC NO. 36024

HINKAMP J B
AROMATIC ALDEHYDES AND PHENOLS IN THE EXHAUST FROM LEADED AND UNLEADED FUELS.
*17086 APTIC NO. 35477

HIRABAYASHI T
INCINERATION OF RHODANIDE SALT.
*17255 APTIC NO. 35048

HIRAMATSU A
THINKING IN LOCAL PUBLIC NUISANCE CONTROL PLANS IN THE NAGOYA AREA AND OTHERS.
*17874 APTIC NO. 35777

HIRAOKA M
PERFORMANCE ON ROTATIONAL VANE TYPE SCRUBBER.
17319 APTIC NO. 35959

HIRAYAMA K
AIR CLEANING APPARATUS.
*17256 APTIC NO. 35917
AIR CLEANER.
*17257 APTIC NO. 35932

HIRSCHLER D A
MEETING FUTURE EMISSION STANDARDS WITH LEADED FUELS.
17178 APTIC NO. 35778

HISHINUMA Y
SULPHUR DIOXIDE EXTRACTION BY CHARCOAL ABSORPTION.
17381 APTIC NO. 35298

HISSEL J
LABORATORY STUDY OF ATMOSPHERIC CORROSION OF STRUCTURAL STEEL. METHODS AND RESULTS.
*17822 APTIC NO. 35158

HOCHHEISER S
ATMOSPHERIC SURVEILLANCE: THE CURRENT STATE OF AIR MONITORING TECHNOLOGY.
*17479 APTIC NO. 35320

HODGKINSON G E
NOTE: SOME USES OF CALCIUM CHLORIDE AS AN ADDITIVE TO BOILER COALS.
17223 APTIC NO. 35722

HOFFMAN E F
LUNG CANCER MORTALITY GEOGRAPHIC DISTRIBUTION IN THE UNITED STATES FOR 1948-1949.
*17742 APTIC NO. 35600

HOFFMAN G L
GASEOUS BROMINE AND PARTICULATE LEAD, VANADIUM, AND BROMINE IN A POLLUTED ATMOSPHERE.
17562 APTIC NO. 35861

HOHENEMSER K H
AIRCRAFT IN THE BALANCE.
*17087 APTIC NO. 35283

HOICKA J
GOVERNMENT APPROACHES TO AIR POLLUTION CONTROL. A COMPENDIUM AND ANNOTATED BIBLIOGRAPHY.
17898 APTIC NO. 35364

HOLCOMBE J K
THE EFFECTS OF AIR CONDITIONING COMPONENTS ON POLLUTION IN INTAKE AIR.
*17258 APTIC NO. 35544

HOLLENBACH K
INVESTIGATION ABOUT THE EFFECTS OF A SINGLE INTRATRACHEAL APPLICATION OF APATITE-NEPHELINE AND APATITE-CONCENTRATE DUST TO RAT LUNGS.
*17743 APTIC NO. 35973

HOLMER H E A
DEVICE FOR THE REDUCTION OF WHITE EXHAUST GASES FOLLOWING A COLD START AND FOR THE IMPROVEMENT OF HEAT STORAGE CHARACTERISTICS IN INTERNAL COMBUSTION ENGINES.
*17259 APTIC NO. 35142

HOLZWORTH G C
LARGE-SCALE WEATHER INFLUENCES ON COMMUNITY AIR POLLUTION POTENTIAL IN THE UNITED STATES.
*17613 APTIC NO. 35601

HOPPEL W A
CHARGE TRANSPORT THROUGH AN AEROSOL CLOUD.
*17681 APTIC NO. 35267

HORE F R
POLLUTION LEGISLATION IN CANADA AFFECTING THE LIVESTOCK INDUSTRY.
*17875 APTIC NO. 35859

HORIE Y
REVIEW OF ATMOSPHERIC DISPERSION AND URBAN AIR POLLUTION MODELS.
17604 APTIC NO. 35045

HORN K
THE TASKS OF THE PUBLIC HEALTH SYSTEM OF THE GERMAN DEMOCRATIC REPUBLIC IN THE FIELD OF THE HYGIENE OF THE AIR.
17870 APTIC NO. 35628

HORTON R J M
DISCUSSION OF NATIONAL AIR QUALITY STANDARDS FOR AUTOMOTIVE POLLUTANTS: A CRITICAL REVIEW.
17837 APTIC NO. 35384

HOUBEN W P
HYDROCARBON ANALYSIS IN AUTO EXHAUST BY VARIOUS INSTRUMENTAL METHODS.
*17480 APTIC NO. 35831

HOVEN I V
ATMOSPHERIC TRANSPORT AND DIFFUSION IN THE PLANETARY BOUNDARY LAYER JANUARY - JULY 1970.
*17614 APTIC NO. 35230

HOWARTH W J
THE COLLISION EFFICIENCY OF SMALL PARTICLES WITH SPHERICAL AIR BUBBLES.
17230 APTIC NO. 35754

HOWELL R K
OZONE INJURY TO SOYBEAN COTYLEDONARY LEAVES.
*17798 APTIC NO. 35053

HOWORTH F H
APPARATUS FOR FILTERING POLLUTED AIR.
*17260 APTIC NO. 35955

HRUTFIORD B F
SIZE DISTRIBUTION OF AEROSOLS FROM A KRAFT MILL RECOVERY FURNACE.
17541 APTIC NO. 35051

HUBBERT M K
THE ENERGY RESOURCES OF THE EARTH.
*17088 APTIC NO. 35866

HUBER E W
MEASURING THE TRAPPING EFFICIENCY OF INTERNAL COMBUSTION ENGINES THROUGH CONTINUOUS EXHAUST GAS ANALYSIS.
*17089 APTIC NO. 35691

HUBER M
THE BMW EXPERIMENTAL ELECTRIC AUTOMOBILE.
*17090 APTIC NO. 35326

HUBERMAN E
ENZYMATIC HYDROXYLATION OF BENZOPYRENE AND ITS RELATIONSHIP TO CYTOTOXICITY.
17676 APTIC NO. 35639

HUDDAR B B
INTERESTING EVIDENCE OF STRATOSPHERIC DUST FROM ELECTRICAL CONDUCTIVITY MEASUREMENTS.
17561 APTIC NO. 35823

HUEBNER A L
THE EFFECT OF CHARGE TRANSPORT ON LIQUID JETS AND LIQUID DROPS. (INTERIM REPORT).
*17682 APTIC NO. 35200

HUGHES L H
GAS DISPERSAL UNIT.
*17091 APTIC NO. 35350

HUGON J
RESULTS OF FULL SCALE ATMOSPHERIC DIFFUSION EXPERIMENTS.
17642 APTIC NO. 35084

HUNGATE E C
DEVICE FOR THE SEPARATION OF DROPLETS FROM A FLOW OF GAS.
*17261 APTIC NO. 35529

HUNT B G
A DIFFUSIVE-PHOTOCHEMICAL STUDY OF THE MESOSPHERE AND LOWER THERMOSPHERE AND THE ASSOCIATED CONSERVATION MECHANISMS.
*17615 APTIC NO. 35993

HUNTER G JR
THE DETERMINATION OF AMINOKETONES IN BIOLOGICAL FLUIDS.
17752 APTIC NO. 35620

HUTCHFIELD J K
IMPROVEMENTS IN OR RELATING TO HYDROGEN SULPHIDE REMOVAL FROM GASES.
*17262 APTIC NO. 35189

HUTTON R
POLLUTION -- INDUSTRY TAKES THE NOX.
*17263 APTIC NO. 35930

HYATT C J
CENTRIFUGAL SEPARATORS.
17195 APTIC NO. 35740

HYCHE C M
DETERMINATION OF MERCURY IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES BY NEUTRON ACTIVATION ANALYSIS.
17522 APTIC NO. 35083

HYDE A P S
AIR PUMP FLOW CONTROL VALVE FOR ENGINE EXHAUST EMISSION CONTROL SYSTEM.
17403 APTIC NO. 35504

HYMAN M H
GASOLINE LEAD ADDITIVES -- A BALANCED VIEWPOINT.
*17264 APTIC NO. 35816

I

IALAMOV LU I
THEORY OF THE MOTION OF MODERATELY COARSE VOLATILE AEROSOL PARTICLES IN HETEROGENEOUS GASES.
17674 APTIC NO. 35132

IANNACCONE A
INVESTIGATION OF MERCURY IN THE CEREBROSPINAL FLUID OF SUBJECTS EXPOSED TO CHRONIC OCCUPATIONAL HYDRARGYRISM HAZARDS.
17737 APTIC NO. 35767

IBRAGIMOV I KH
UTILIZATION OF SULFUR DIOXIDE FROM INDUSTRIAL WASTES.
*17265 APTIC NO. 35133

ICHIJO M
JAPAN TODAY: POLLUTION-FREE METALLURGY.
*17266 APTIC NO. 35296

ICHIKAWA M
PROBLEMS IN PLASTIC WASTE INCINERATORS.
*17267 APTIC NO. 35746

ICHIKAWA S
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE. AS CONCLUSION FROM 1965 TO 1971.
17557 APTIC NO. 35116

IDEL CHIK I E
CHOICE OF ELECTROSTATIC PRECIPITATOR COMPONENTS IN HIGH CAPACITY UNITS, AND THEIR MODELLING.
*17268 APTIC NO. 35874

II IZUMI O
HISTOPATHOLOGICAL STUDIES OF PARANASAL SINUSES OF GERM-FREE GUINEA PIG EXPOSED TO SULFUR DIOXIDE GAS (SO2).
*17744 APTIC NO. 35153

IIJIMA H
FLUIDIZED BED INCINERATION SYSTEM.
17179 APTIC NO. 35496

IINOYA K
TREATMENT OF DUST AND ITS CONTROL MEASURE.
*17269 APTIC NO. 35863
AEROSOL DIFFUSION.
17629 APTIC NO. 35939

ILLIG E G
THE REGENERATION OF ALKALIZED ALUMINA.
17357 APTIC NO. 35537

IMAI M
SURVEY ON MORBIDITY, MORTALITY, MEDICAL EXAMINATION OF THE RESIDENTS, AND MEDICAL EXAMINATION OF SCHOOL CHILDREN AND APPROVED VICTIMS OF ENVIRONMENTAL HAZARD.
17733 APTIC NO. 35099
PATHOLOGICAL STUDY CONCERNING RESPIRATORY PHYSIOLOGY AND SEROLOGICAL STUDY OF VICTIMS OF POLLUTIONS. (PART 2) OBSTRUCTIVE RESPIRATORY DISEASES DUE TO AIR POLLUTION AND CONCENTRATION OF BLOOD PLASMA HISTAMINE.
17760 APTIC NO. 35506

IMAI T
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965
AIR PURIFICATION BY ACTIVATED CARBON FILTERS.
*17270 APTIC NO. 36019

IMAMURA S
SMALL INCINERATOR OF THE COMBUSTOR TYPE.
*17271 APTIC NO. 35548

INABA H
LASER-RAMAN RADAR FOR AIR POLLUTION PROBE.
17486 APTIC NO. 35160

INABA K
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

INAGAKI N
TELEPHONE EXCHANGE AIR PURIFICATION IN AN INDUSTRIAL DISTRICT.
*17823 APTIC NO. 35096

INFELD D
GOVERNMENT APPROACHES TO AIR POLLUTION CONTROL. A COMPENDIUM AND ANNOTATED BIBLIOGRAPHY.
17898 APTIC NO. 35364

INMAN J K
TRANSFER OF IRON FROM SERUM IRON-BINDING PROTEIN TO HUMAN RETICULOCYTES.
17745 APTIC NO. 35233

INOGUCHI M
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
*17272 APTIC NO. 35923
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
*17273 APTIC NO. 35924

INOUE K
DESULFURIZATION PROCESS.
*17274 APTIC NO. 35095
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

INOUE M
DRY DUST COLLECTION PRINCIPLES AND HIGH PRESSURE EXPANSION CLEANING.
*17275 APTIC NO. 35999

IRIONDO J M
AIR ANALYZER.
*17481 APTIC NO. 35966

IRWIN D S
BIOLUMINESCENCE AND SINGLET OXYGEN.
*17799 APTIC NO. 36028

ISEKI K
PUBLIC NUISANCE CONTROL MEASURES AND CITY PLANNING.
*17876 APTIC NO. 35718

ISHIFUKU A
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

ISHIGURO T
THE DIRECTION OF ODOR CONTROL AND REGULATIONS.
*17877 APTIC NO. 35752

ISHII Y
ESTIMATION OF AIR POLLUTANTS DEPOSITION ON INSULATOR BY CHEMICAL ANALYSES.
*17824 APTIC NO. 35460

ISHIKAWA K
DATA AND EXAMINATION FOR ESTABLISHING SULFUR OXIDES EMISSION STANDARD.
17846 APTIC NO. 35146

ISHIZUTANI A
ENGINE EXHAUST GAS RECOMBUSTION APPARATUS.
17407 APTIC NO. 35915

ISHIZUYA A
AFTERBURNER APPARATUS FOR ENGINE EXHAUST GAS.
17406 APTIC NO. 35290

ISSLER J
IGNITION AND EXHAUST GAS.
*17276 APTIC NO. 35247

ITO E
PRESENT STATUS OF DESULFURIZATION FROM FLUE GAS ON THERMAL POWER PLANT FOR THE ELECTRIC UTILITY INDUSTRY.
*17277 APTIC NO. 35963

ITO J
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

ITO N
STACK GAS DESULFURIZATION BY ACTIVATED CARBON. (GAS SEPARATION METHOD).
17312 APTIC NO. 35997

IVANOV B
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

IVANOV D
APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS IN STUDYING THE REGENERATION PROCESS OF A LOW-TEMPERATURE CATALYST UTILIZED FOR THE CONVERSION OF CARBON MONOXIDE.
17365 APTIC NO. 35755

IVANOV IV
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

IWAI H
TEST OF SMOKE DEVELOPEMENT FROM SYNTHETIC MATERIALS USED FOR RAILWAY VEHICLES.
17101 APTIC NO. 35459

IXFELD H
THE SUPERVISION AND MEASUREMENT OF ATMOSPHERIC POLLUTION IN THE RHINE-NORTH WESTPHALIA REGION.
*17878 APTIC NO. 35362

J

JACKSON G E
PHOTOOXIDATION OF SULFUR DIOXIDE.
17649 APTIC NO. 35856

JACKSON W D
A CRITIQUE OF MHD POWER GENERATION.
*17092 APTIC NO. 35472

JACKSON W E JR
REGIONAL AIR QUALITY CONTROL - THE IMPACT AND COSTS OF REFUSE INCINERATION.
17833 APTIC NO. 35215

JACOBSON M
A METHOD FOR SAMPLING AND ANALYZING TRONA DUST.
*17482 APTIC NO. 35205

JAENICKE R
NEW RESULTS IN BACKGROUND AEROSOLS STUDIES FROM THE ATLANTIC EXPEDITION OF THE R. V. METEOR, SPRING 1969.
17618 APTIC NO. 35812

JAHNKE H
ELECTRIC DUST TRAP.
*17278 APTIC NO. 35126

JAKLEVIC J M
TRACE ELEMENT ANALYSIS BY X-RAY FLUORESCENCE.
17472 APTIC NO. 35401

JAKUBCZAK Z
SOME MORPHOLOGICAL VARIATIONS OF THE NEEDLES AND SHOOTS OF SCOTS PINE/PINUS SILVESTRIS L./ IN THE POLLUTED SURROUNDINGS OF NITROGEN PLANT AT PULAWY.
*17800 APTIC NO. 35185

JANDL J H
TRANSFER OF IRON FROM SERUM IRON-BINDING PROTEIN TO HUMAN RETICULOCYTES.
*17745 APTIC NO. 35233

JANIN R
THE ACTION OF THE ELECTRIC POWER INDUSTRY IN FRANCE.
*17279 APTIC NO. 35097

JANOSO R P
SYSTEM-WIDE AIR POLLUTION CONTROL.
*17280 APTIC NO. 35492

JAY M
PURIFICATION OF ATMOSPHERIC POLYCYCLIC AROMATIC HYDROCARBONS BY THIN LAYER CHROMATOGRAPHY.
17450 APTIC NO. 35131

JECH J
VITAL CAPACITY AND FORCED INSPIRATION TEST IN SCHOOL CHILDREN OF THE FOURTH AND FIFTH GRADE FROM AREAS WITH DIFFERENT AIR HYGIENE CONDITIONS.
17739 APTIC NO. 35968

JEFFRIES H E
ORGANIC MATTER IN MARINE LIGHT-SCATTERING AEROSOLS. (FINAL REPORT).
17565 APTIC NO. 35367

JENKINS I
DECREASE IN THE FREQUENCY OF FOG IN CENTRAL LONDON.
*17616 APTIC NO. 35875

JEQUIER W
PURIFICATION OF ATMOSPHERIC POLYCYCLIC AROMATIC HYDROCARBONS BY THIN LAYER CHROMATOGRAPHY.
17450 APTIC NO. 35131

JERNIGAN E L
LEAD AND BROMINE IN ATMOSPHERIC PARTICULATE MATTER ON OAHU, HAWAII.
*17553 APTIC NO. 35725

JESSON M W
TOXIC GASES IN TOWER SILOS.
17544 APTIC NO. 35501

JIROUS F
CALCULATION OF FLUE GAS AND TUBE WALL TEMPERATURES DURING START-UP OF A STEAM GENERATOR.
*17093 APTIC NO. 35757

JOHN M K
LEAD CONTAMINATION OF SOME AGRICULTURAL SOILS IN WESTERN CANADA.
*17094 APTIC NO. 35065

JOHNE R
A CRITICAL OBSERVATION ON METHODS FOR ANALYSIS OF THE SIZES OF FINE PARTICLES.
17513 APTIC NO. 35627

JOHNSON G G JR
PARTICLE SIZE DISTRIBUTIONS OF PARTICULATE ALUMINAS FROM COMPUTER-PROCESSED SEM IMAGES.
17529 APTIC NO. 35571

JONASSON I R
GEOCHEMISTRY OF MERCURY AND ORIGINS OF NATURAL CONTAMINATION OF THE ENVIRONMENT.
*17095 APTIC NO. 36011

JONES F L
APPLICATION OF COMPUTER SIMULATION TECHNIQUES TO THE PREDICTION OF FLAME GAS EMISSIONS. THE EFFECTS OF ELECTRIC FIELDS ON FLAME PROPERTIES.
*17683 APTIC NO. 35270

JONES F N
OLFACTORY THRESHOLDS IN THE INTERNATIONAL CRITICAL TABLES.
*17684 APTIC NO. 35651

JONES I T N
ENERGY TRANSFER FROM ELECTRONICALLY EXCITED N 2.
*17617 APTIC NO. 35493

JONES N M
DIESEL FUEL ADDITIVE.
*17281 APTIC NO. 35672

JOSHI M S
LEAD QUANTITIES IN PLANTS, SOIL, AND AIR NEAR SOME MAJOR HIGHWAYS IN SOUTHERN CALIFORNIA.
17812 APTIC NO. 35827

JOUBERT J D
CONSIDERATIONS ON THE VARIOUS METHODS FOR CHARACTERIZING AIR POLLUTION.
*17483 APTIC NO. 35632

JOYCE C R B
THE EFFECTS OF LEAD, MERCURY, AND GOLD ON THE POTASSIUM TURNOVER OF RABBIT BLOOD CELLS.
*17746 APTIC NO. 35218

JUNGE C
DETERMINATION OF THE ACID CONTENT OF AEROSOL PARTICLES.
*17554 APTIC NO. 35545

NEW RESULTS IN BACKGROUND AEROSOLS STUDIES FROM THE ATLANTIC EXPEDITION OF THE R. V. METEOR, SPRING 1969.
*17618 APTIC NO. 35812

JUST J
CADMIUM IN ATMOSPHERIC AIR OF 10 SELECTED TOWNS IN POLAND.
*17555 APTIC NO. 35715

K

KABE T
STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL2O3.
17294 APTIC NO. 36007

KADOTA M
AIR POLLUTION AND TREES: THE CREATION OF URBAN WOODS.
*17801 APTIC NO. 35964

KAGAYA H
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923

STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

KAINO M
TOKYO MUNICIPAL RESEARCH INSTITUTE FOR ENVIRONMENTAL POLLUTION AND I - A PERSONAL VIEW.
*17879 APTIC NO. 35149

KALIKA P W
THE EFFECTS OF AIR CONDITIONING COMPONENTS ON POLLUTION IN INTAKE AIR.
17258 APTIC NO. 35544

KALINSKY J L
DETECTION OF TOXIC ORANOPHOSPORUS AIRBORNE SUBSTANCES BY FRUSTATED MULTIPLE INTERNAL REFLECTION SPECTROSCOPY.
17512 APTIC NO. 35348

KALPAZANOV Y
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

KAMATA T
EXAMPLES OF ENVIRONMENTAL IMPROVEMENT AND DUST COLLECTION METHODS FOR THE MELTING PLANT OF THE COPPER EXPANSION FACTORY.
*17282 APTIC NO. 35769

KANEKO Y
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923

KANNO S
HYGIENIC CHEMICAL STUDIES ON PUBLIC HAZARDS BY HARMFUL SUBSTANCES. IV. ATOMIC ABSORPTION PHOTOMETRIC DETERMINATION OF LEAD IN GASOLINE.
17143 APTIC NO. 36006

KARELS G G
IMPROVED SAMPLING METHOD REDUCES ISOKINETIC SAMPLING ERRORS.
*17484 APTIC NO. 35263

KARZHAVIN V A
PRODUCTION OF SULFUR FROM SULFUR DIOXIDE.
17412 APTIC NO. 35413

KASUYAMA T
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE AS CONCLUSION FROM 1965 TO 1971.
17557 APTIC NO. 35116

KATZ M
INTERSOCIETY COMMITTEE METHODS FOR AMBIENT AIR SAMPLING AND ANALYSIS.
*17838 APTIC NO. 35520

KAWAGISHI F
PATHOLOGICAL STUDY CONCERNING RESPIRATORY PHYSIOLOGY AND SEROLOGICAL STUDY OF VICTIMS OF POLLUTIONS (PART 2) OBSTRUCTIVE RESPIRATORY DISEASES DUE TO AIR POLLUTION AND CONCENTRATION OF BLOOD PLASMA HISTAMINE.
17760 APTIC NO. 35506

KAWAKAMI Y
CHOICE OF ACTIVABLE TRACER FOR SPRAYING AGRICULTURAL INSECTICIDES BY HELICOPTER.
17434 APTIC NO. 35621

KAWANAKA S
THE CHEMICO TYPE STACK GAS DESULFURIZATION SYSTEM.
*17283 APTIC NO. 35832

KAZARIAN R A
MEASUREMENT OF THE AVERAGE STRUCTURAL CHARACTERISTIC OF THE ATMOSPHERIC REFRACTIVE INDEX.
*17619 APTIC NO. 35700

KEARBY K K
APPLICATION OF CATALYSTS TO AUTOMOTIVE NOX EMISSIONS CONTROL.
17197 APTIC NO. 35223

KECK J C
TIME-RESOLVED MEASUREMENTS OF HYDROCARBON MASS FLOW RATE IN THE EXHAUST OF A SPARK-IGNITION ENGINE.
17141 APTIC NO. 35580

KEELING C D
IS CARBON DIOXIDE FROM FOSSIL FUEL CHANGING MAN S ENVIRONMENT? Proc. Am. Phil. Soc., 114(1):10-17, Feb. 1970. 17 refs. (Presented at the American Philosophical Society Symposium on Atmospheric Pollution: Its Long-term Implications, April 25, 1969.)
*17620 APTIC NO. 35617
REMOVAL OF H2S IN FERTILIZER INDUSTRY -- A SURVEY OF THE VARIOUS PROCESSES.
*17284 APTIC NO. 35926

KELUS J
CADMIUM IN ATMOSPHERIC AIR OF 10 SELECTED TOWNS IN POLAND.
17555 APTIC NO. 35715

KENNEDY W R
LOS ALAMOS ENVIRONMENTAL MONITORING PROGRAM JULY THROUGH DECEMBER 1970.
*17556 APTIC NO. 35407

KENT R F
GAS SCRUBBER.
*17285 APTIC NO. 35552

KERIN D
DELIMITATION OF INDUSTRIAL EMISSIONS BY MEANS OF PLANT ANALYSIS.
*17802 APTIC NO. 35880

KERLEY R V
ENGINES AND EFFECTS OF LEAD-FREE GASOLINE.
17070 APTIC NO. 35199

KERR E D
EFFECTS OF AIR POLLUTION ON VEGETATION IN NEBRASKA.
*17803 APTIC NO. 35394

KERSTEN E
INVESTIGATION ABOUT THE EFFECTS OF A SINGLE INTRATRACHEAL APPLICATION OF APATITE NEPHELINE AND APATITE-CONCENTRATE DUST TO RAT LUNGS.
17743 APTIC NO. 35971

KESHEN A S
SOLID RUBBER WASTES.
*17098 APTIC NO. 35384

KESTER D R
FLUORIDE ANALYSIS IN THE NORTHWEST ATLANTIC OCEAN.
*17097 APTIC NO. 35198

KESTIN J
REFERENCE VALUES OF THE VISCOSITY OF TWELVE GASES AT 25 C.
*17685 APTIC NO. 35143

KETOV A N
DRY LIME METHOD FOR REMOVING SULFUR DIOXIDE FROM FUEL GASES IN A THERMOELECTRIC POWER PLANT. V. REACTION OF CALCIUM OXIDE WITH SULFUR DIOXIDE.
*17286 APTIC NO. 35487

KHALIKOVA R KH
ON DAILY AND SEASONAL VARIATIONS OF CO2 CONTENT IN THE NEAR GROUND LAYER OF THE ATMOSPHERE.
17547 APTIC NO. 35761

KHAN I M
FORMATION AND COMBUSTION OF CARBON IN A DIESEL ENGINE.
*17098 APTIC NO. 35685

KHAR KOVSKII M S
PREVENTION OF DEPOSIT FORMATION IN SCRUBBERS.
17220 APTIC NO. 35945

KHLEBNIKOV YU P
STUDIES ON THE REGENERATION OF UNWOVEN FILTER FABRICS.
17299 APTIC NO. 35758

KHRGIAN A KH
VARIATIONS OF ATMOSPHERIC OZONE IN UPPER AIR PRESSURE FORMATIONS.
*17621 APTIC NO. 35781

KHVAN YE A
SOME CHEMICAL AND COLLOIDAL PROPERTIES OF CURING SMOKE.
*17686 APTIC NO. 35239

KIIGEMAGI U
LOSSES OF ORGANOPHOSPHORUS INSECTICIDES DURING APPLICATION TO THE SOIL.
*17099 APTIC NO. 35089

KILLALA N J P
FACTORS INFLUENCING EXPOSURE OF CHILDREN TO LEAD.
17900 APTIC NO. 35206

KIM Y H
GAS ANALYZER.
*17485 APTIC NO. 35337

KIMURA K
EXPERIMENTAL STUDIES ON THE AEROSOL DEPOSITION IN THE HUMAN RESPIRATORY SYSTEM (REP. 2).
*17747 APTIC NO. 35071

KING J F JR
FILTERING APPARATUS FOR THE FILTRATION OF GAS CONTAINING PARTICULATE MATTER ESPECIALLY OF AIR CONTAINING PARTICULATE POLLUTANTS AND THE APPLICATION OF THE FILTERING DEVICE.
[illegible] APTIC NO. 35139
FILTERING APPARATUS FOR THE FILTRATION OF GAS CONTAINING PARTICULATE MATTER ESPECIALLY OF AIR CONTAINING PARTICULATE POLLUTANTS.
*17288 APTIC NO. 35140

KINSLEY H
USE OF FIBREGLASS REINFORCED PLASTICS IN A BOILERHOUSE CHIMNEY.
*17100 APTIC NO. 35057

KIPOT N S
BRUSH DISCHARGE FILTERS USED FOR THE REMOVAL OF NITRIC OXIDE FROM COKE OVEN GAS.
*17289 APTIC NO. 35759

KIRK D E
DEVELOPMENT AND TESTING OF MOBILE FIELD INCINERATOR.
17052 APTIC NO. 35260

KISHIMOTO K
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

KITA N
TEST OF SMOKE DEVELOPEMENT FROM SYNTHETIC MATERIALS USED FOR RAILWAY VEHICLES.
*17101 APTIC NO. 35459

KITAMURA N
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE. AS CONCLUSION FROM 1965 TO 1971.
*17557 APTIC NO. 35116

KITAZONO K
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

KITROSSKY N A
THE PHYSICOCHEMICAL MECHANISM OF OZONE AND PHOTOOXIDANTS FORMATION IN THE ATMOSPHERE.
17600 APTIC NO. 35987

KIYOURA R
ENERGY AND POLLUTION -- DEVELOPMENT OF POLLUTION-FREE FUEL.
*17102 APTIC NO. 35052

KLARMANN J
POWER FROM THE EARTH.
17071 APTIC NO. 35124

KLEIN N
SMOKE CLEANING APPARATUS.
*17290 APTIC NO. 35554

KLEINMAN A
INVESTIGATION OF LEAD RESIDUES ON GROWING FRUITS AND VEGETABLES.
*17804 APTIC NO. 35410

KLEISINGER J
FILTERING LAYER MANUFACTURING METHOD AND MEANS.
17205 APTIC NO. 35885

KLEPEIS J E
A CRITIQUE OF MHD POWER GENERATION.
17092 APTIC NO. 35472

KLIMOV I T
ON THE OCCURRENCE OF SOME HEAVY METALS IN ATMOSPHERIC PRECIPITATIONS ON THE TERRITORY OF GEORGIAN SOVIET REPUBLIC.
17653 APTIC NO. 35669

KNELSON J H
DISCUSSION OF NATIONAL AIR QUALITY STANDARDS FOR AUTOMOTIVE POLLUTANTS: A CRITICAL REVIEW.
17837 APTIC NO. 35384

KNUDSEN H L
DIESEL ENGINE EXHAUST GASES.
*17103 APTIC NO. 35597

KOBAYASI T
LASER-RAMAN RADAR FOR AIR POLLUTION PROBE.
*17486 APTIC NO. 35160

KOCK P
ON SMOKES AND SULFUR.
*17291 APTIC NO. 35726

KODAMA B
ON AIR POLLUTION AND CHRONIC OBSTRUCTIVE DISEASES OF INFANTS.
*17748 APTIC NO. 35147

KOEHNLEIN W
BUTANE, A NEW FUEL FOR ASPHALT MIXING PLANTS.
17080 APTIC NO. 35980

KOENN G
INVESTIGATIONS ON THE BENZO(A)PYRENE CONTENT OF HUMAN LUNGS.
17778 APTIC NO. 35972

KOEPERNIK K L
A METHOD OF PRODUCING A CATALYST OF LOW SENSITIVITY TO LEAD FOR OXIDISING THE EXHAUST GASES OF MOTOR CARS.
*17292 APTIC NO. 35703

KOIDE K
ANALYSIS AND EXPERIMENTS ON CARBURETOR METERING AT THE TRANSITION REGION TO THE MAIN SYSTEM.
17134 APTIC NO. 35614

KOIDE M
ATMOSPHERIC SULFUR AND FOSSIL FUEL COMBUSTION.
*17104 APTIC NO. 35788

KOINUMA Y
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
*17293 APTIC NO. 36004

KOMLEV A A
UTILIZATION OF FLOCCULATING MEANS FOR PARTICLE SEDIMENTATION FROM GAS CLEANING SOLUTIONS.
17413 APTIC NO. 35328

KONONENKO A F
DISCHARGES TO ATMOSPHERE FROM BENZOLE PLANT.
17558 APTIC NO. 35081

KOTERA Y
STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL203.
*17294 APTIC NO. 36007

KOTIN P
AROMATIC POLYCYCLIC HYDROCARBONS IN POLLUTED AIR AS INDICATORS OF CARCINOGENIC HAZARDS.
17464 APTIC NO. 35640

KOTRAPPA P
SHAPE FACTORS FOR QUARTZ AEROSOL IN RESPIRABLE SIZE RANGE.
*17687 APTIC NO. 35312

KOUMIDES O P
LEAD POISONING IN CHILDREN.
17756 APTIC NO. 35462

KOVALEV V P
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
17180 APTIC NO. 35478

KOYAYASHI S
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

KOZAK H C
FLUID-HANDLING, GAS-SCRUBBING, AND BLAST FURNACE TOP PRESSURE CONTROL.
*17295 APTIC NO. 35549

KREMER D F
OZONE INJURY TO SOYBEAN COTYLEDONARY LEAVES.
17798 APTIC NO. 35053

KRESSLEY L K
METHOD OF REMOVING SULFUR DIOXIDE AND PARTICULATE MATTER FROM GASEOUS STREAMS.
17233 APTIC NO. 35717

KREYBERG L
THREE:FOUR-BENZPYRENE IN INDUSTRIAL AIR POLLUTION: SOME REFLEXIONS.
*17105 APTIC NO. 35641

KRIEGEL E
PERFORATED-BOTTOM WASHERS FOR THE EXHAUSTED AIR FROM PAINT SPRAYING SHOPS.
*17296 APTIC NO. 35878

KRUG H
PHYSICAL PRINCIPLES OF A.C.-OPERATED ELECTROSTATIC PRECIPITATORS.
*17297 APTIC NO. 35558

KRUPP H
GAS ANALYZER.
17463 APTIC NO. 35514

KRYUKOV G I
PHOTOELECTRIC GAS ANALYZERS.
*17487 APTIC NO. 35605

KUBO J
HYDRODESULFURIZATION OF HEAVY PETROLEUM HYDROCARBON OIL IN A FLUIDIZED REACTION ZONE.
17334 APTIC NO. 35349

KUBO S
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

KUHN A T
ELECTROCHEMICAL METHODS FOR SO2 FLUE GAS TREATMENT.
*17298 APTIC NO. 35809

KULIKOV G S
STUDIES ON THE REGENERATION OF UNWOVEN FILTER FABRICS.
*17299 APTIC NO. 35758

KUMMER J T
THE BEHAVIOR OF NITRIC OXIDE IN HETEROGENEOUS CATALYTIC REACTIONS.
17693 APTIC NO. 35311

KUMMER W A
CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES.
*17488 APTIC NO. 35091
CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES.
*17489 APTIC NO. 35491

KUPEL R E
A RAPID METHOD EMPLOYING IMPREGNATED CHARCOAL AND ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR THY DETERMINATION OF MERCURY.
17503 APTIC NO. 35840

KUPRYAKOV YU P
PRODUCTION OF SULFURIC ACID FROM REVERBERATORY FURNACE FLUE GASES.
17337 APTIC NO. 35333

KURATA E
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
*17106 APTIC NO 35965

KURATA M
STUDY OF EARLY RECOVERY IN SMOKE DAMAGED AREAS II. POLICY IN THE SMOKE-DENUDED AREA IN ASHIO (CENTRAL HONSHU).
*17805 APTIC NO. 35388

KURATOVA T S
A SPECTROCHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF MICROCONTAMINANTS IN GASES.
17520 APTIC NO. 35327

KURITA M
HYDRODESULFURIZATION IN KHAFJI RESIDUE OIL.
*17300 APTIC NO. 35085
STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL203.
17294 APTIC NO. 36007

KURITA S
CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.
*17301 APTIC NO. 35920

KUSCHNER M
EXPERIMENTAL MODELS IN ENVIRONMENTAL CARCINOGENESIS.
*17749 APTIC NO. 35347

KUSHEV D
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

KUTUZOVA L N
DISCHARGES TO ATMOSPHERE FROM BENZOLE PLANT.
*17558 APTIC NO. 35081

KYLE M L
LITHIUM/SULFUR CELLS AND THEIR POTENTIAL FOR VEHICLE PROPULSION.
17133 APTIC NO. 35539

L

LAAMANEN A
CROSS-CORRELATIONS IN TIME SERIES OF SOME PARTICLE FALL COMPONENTS ON RELATION TO URBAN AREA TYPE.
*17559 APTIC NO. 35940

LACY P
ENVIRONMENTAL PATHOBIOLOGY -- COMBINED APPROACH TO PROBLEM SOLVING AND MANPOWER TRAINING.
*17880 APTIC NO. 35059

LAHMANN E
EXTRAORDINARY CARBON MONOXIDE CONCENTRATIONS IN THE AIR OF MAJOR CITIES.
17605 APTIC NO. 35357
PROPERTIES OF THE AIR.
17083 APTIC NO. 35455

LAKTIONOV A G
ON THE DEPENDENCE OF MAXIMUM SUPERSATURATIONS AND THE CONCENTRATION OF DROPLETS FORMED IN A RISING AIR CURRENT ON THE SPECTRUM OF CLOUD NUCLEI.
*17622 APTIC NO. 35562

LAMZHAVYN B
VARIATIONS OF ATMOSPHERIC OZONE IN UPPER-AIR PRESSURE FORMATIONS.
17621 APTIC NO. 35781

LANDBERG A
AIR POLLUTION FROM OIL FUELS.
*17107 APTIC NO. 35743

LANG D A
OBJECTIVE MEASUREMENT OF ODOR: IONIZATION DETECTION OF FOOD VOLATILES.
17493 APTIC NO. 35648

LANGER H
FILTERING LAYER MANUFACTURING METHOD AND MEANS.
17205 APTIC NO. 35885

LARDIERI N J
PRESENT TREATMENT PRECTICE OF KRAFT MILLS ON AIR-BORNE EFFLUENTS.
*17302 APTIC NO. 35660

LARIKOV V V
DRY LIME METHOD FOR REMOVING SULFUR DIOXIDE FROM FUEL GASES IN A THERMOELECTRIC POWER PLANT. V. REACTION OF CALCIUM OXIDE WITH SULFUR DIOXIDE.
17286 APTIC NO. 35487

LASKIN S
EXPERIMENTAL MODELS IN ENVIRONMENTAL CARCINOGENESIS.
17749 APTIC NO. 35347

LAUDERBACK W
UNIQUE FLARE SYSTEM RETARDS SMOKE.
*17303 APTIC NO. 35989

LAWRENCE E N
URBAN CLIMATE AND DAY OF THE WEEK.
*17623 APTIC NO. 35841

LAWSON J R
ENVIRONMENTAL ASPECTS OF SITE SELECTION FOR A PETROLEUM REFINERY.
17062 APTIC NO. 35887

LAWSON L J
FLYWHEEL FEASIBILITY STUDY AND DEMONSTRATION. (FINAL REPORT).
17076 APTIC NO. 35445

LAYTON A F
AIR POLLUTION AND TOTAL ENVIRONMENTAL HEALTH.
17342 APTIC NO. 35706

LEADS R
THE PRODUCTION OF AN EMPHYSEMA-LIKE CONDITION IN RATS BY THE ADMINISTRATION OF PAPAIN AEROSOL (34750).
17736 APTIC NO. 35181

LEE G K
EFFECT OF FUEL CHARACTERISTICS AND EXCESS COMBUSTION AIR ON SULPHURIC ACID FORMATION ON A PULVERIZED-COAL-FIRED BOILER.
*17108 APTIC NO. 35338
CONTROL OF SO3 IN LOW-PRESSURE HEATING BOILERS BY AN ADDITIVE.
*17304 APTIC NO. 35721

LEE H
RATE OF SULFUR DIOXIDE SORPTION BY ALKALIZED ALUMINA.
*17305 APTIC NO. 35538

LEE S H
SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

LEFORT M
PROCESS FOR SEPARATION OF A GAS.
17215 APTIC NO. 35970

LEONARD C D
SOME EFFECTS OF AIR-BORNE FLUORINE ON GROWTH AND YIELD OF SIX CITRUS VARIETIES.
•17807 APTIC NO. 35896
SOME EFFECTS OF AIR-BORNE FLUORINE ON GROWTH AND YIELD OF SIX CITRUS VARIETIES.
•17806 APTIC NO. 35578

LESCHONSKI K
A CRITICAL OBSERVATION ON METHODS FOR ANALYSIS OF THE SIZES OF FINE PARTICLES.
17513 APTIC NO. 35627

LEVENTHAL J J
ELECTRON TRANSFER AND ION-ATOM INTERCHANGE IN C(+)-CO COLLISIONS.
17688 APTIC NO. 35323

LEWIS D H
CONTROLLING AIR QUALITY: ST. LOUIS CASE STUDY.
17888 APTIC NO. 35423
SOME APPLICATIONS OF THE IMPLEMENTATION PLANNING PROGRAM.
•17881 APTIC NO. 35464

LEWIS T R
SWIMMING AS A LABORATORY METHOD FOR EXERCISING DOGS.
17670 APTIC NO. 35683

LHERMITTE R M
MEASUREMENT OF WIND AND WIND FIELD BY MICROWAVE DOPPLER RADAR TECHNIQUES.
•17624 APTIC NO. 35524

LIEBENOW H
BEARINGS OF IMMISSIONS ON PLANTS AND LIVESTOCK.
•17808 APTIC NO. 35877

LILET L
LABORATORY STUDY OF ATMOSPHERIC CORROSION OF STRUCTURAL STEEL. METHODS AND RESULTS.
17822 APTIC NO. 35158

LIMBOURN G J
AUSTRALIAN SERVICE EXPERIENCE WITH POLLUTION OF HIGH VOLTAGE INSULATION.
•17825 APTIC NO. 35479

LINK W T
A FLUORESCENT SOURCE NDIR CARBON MONOXIDE ANALYZER.
•17490 APTIC NO. 35167

LINKSON P B
THE FILTRATION OF AIR USING FIBROUS FILTERS.
17208 APTIC NO. 35550

LOCKE C E
DEVELOPMENT OF A TEST FACILITY AND SPECIFICATION FOR BREATHABLE AIR FILTERS. (FINAL REPORT).
•17306 APTIC NO. 35251

LODGE J P JR
PARTICLE PRODUCTION BY POLYMER PYROLYSIS: EFFECT OF CARBON MONOXIDE.
17072 APTIC NO. 35786

LOEBSACK T
THE ENVIRONMENT IN DANGER (4). THE POLLUTED AIR.
•17109 APTIC NO. 35077
THE POLLUTED AIR (2).
•17110 APTIC NO. 35078

LOPASOV V P
USE OF HIGH-SPEED LASER SPECTROSCOPY TO STUDY THE ABSORPTION SPECTRUM OF ATMOSPHERIC GASES.
17698 APTIC NO. 35937

LORD E E
LATE EFFECTS OF LEAD POISONING ON MENTAL DEVELOPMENT.
17717 APTIC NO. 35438

LORD R R
AN OZONE-NO CHEMILUMINESCENCE METHOD FOR NO ANALYSIS IN PISTON AND TURBINE ENGINES.
17506 APTIC NO. 35607

LORENTZ F
A CHEMICAL PLANT S SOLUTION OF AERIAL POLLUTION AND WASTE DISPOSAL.
•17307 APTIC NO. 35609

LOVE L O
PRESENT STATUS OF ELECTROMAGNETIC SEPARATION OF STABLE ISOTOPES AT THE OAK RIDGE NATIONAL LABORATORY.
•17308 APTIC NO. 35653

LOW M J D
REACTIONS OF GASEOUS POLLUTANTS WITH SOLIDS. I. INFRARED STUDY OF THE SORPTION OF SO2 ON CAO.
•17309 APTIC NO. 35762

LUCAS D H
THE ATMOSPHERIC POLLUTION OF CITIES.
•17111 APTIC NO. 35467

LUDINGTON D C
CONTROL OF ODORS THROUGH MANURE MANAGEMENT.
•17310 APTIC NO. 35879

LUDWICK J D
ATMOSPHERIC TRACER TECHNIQUE EMPLOYING KR 85 AND USE OF THIS TECHNIQUE IN DEFINING PUFF DIMENSIONS AND TRANSPORT SPEED.
17635 APTIC NO. 35482

LUDWIG J H
TECHNICAL NEEDS IN METEOROLOGY FOR OUR AFFLUENT FUTURE: AIR QUALITY.
•17882 APTIC NO. 35946

LUGG G A
THE DETERMINATION OF TOXIC GASES AND VAPOURS IN AIR.
•17491 APTIC NO. 35450

LUHANOVA Z
THE INFLUENCE OF AIR POLLUTION OF THE NUTRITIONAL CONDITION OF CHILDREN.
•17750 APTIC NO. 35868

LUMLEY J L
EXPLANATION OF THERMAL PLUME GROWTH RATES.
•17625 APTIC NO. 35073

LUNDGREN D A
DETERMINATION OF PARTICULATE COMPOSITON, CONCENTRATION AND SIZE DISTRIBUTION CHANGES WITH TIME.
•17492 APTIC NO. 35494

LUSIS G
THE EFFECT OF AIR POLLUTANTS ON THE EYE. II. A STUDY OF THEIR EFFECT ON THE OCULOCARDIAC REFLEX.
17710 APTIC NO. 35486

LUTEN D B
THE ECONOMIC GEOGRAPHY OF ENERGY.
•17112 APTIC NO. 35844

M

MACCABE L J
AN INTERNATIONAL RESEARCH PROGRAM ON THE LIMITATION OF THE EMISSION OF POLLUTANTS BY AUTOMOBILES.
•17311 APTIC NO. 35324

MACDONALD G J F
THE MODIFICATION OF PLANET EARTH BY MAN.
•17626 APTIC NO. 35473

MACEY H H
TECHNICAL NOTE. BOSANQUET S PLUME RISE FORMULA AND THE T.V.A. DATA.
•17627 APTIC NO. 35846

MACFARLANE E M
THE DISTRIBUTION OF CANCER MORTALITY IN OHIO.
17751 APTIC NO. 35602

MACKAY D A M
OBJECTIVE MEASUREMENT OF ODOR: IONIZATION DETECTION OF FOOD VOLATILES.
•17493 APTIC NO. 35648

MAEDA I
STACK GAS DESULFURIZATION BY ACTIVATED CARBON. (GAS SEPARATION METHOD).
•17312 APTIC NO. 35997

MAHER K E
ELECTRON TRANSFER AND ION-ATOM INTERCHANGE IN C(+)-CO COLLISIONS.
•17688 APTIC NO. 35323

MAHONEY R T
PHOTOFRAGMENT SPECTROMETER.
17447 APTIC NO. 35179

MAKAROV V F
PRODUCTION OF SULFURIC ACID FROM REVERBERATORY FURNACE FLUE GASES.
17337 APTIC NO. 35333

MAKHATOKIN L G
ATMOSPHERIC TURBIDITY CHARACTERISTIC AS A CONSEQUENCE OF GENERAL STATISTICAL REGULARITIES.
*17628 APTIC NO. 35708

MAKINO K
AEROSOL DIFFUSION.
*17629 APTIC NO. 35939

MAKOGON M M
USE OF HIGH-SPEED LASER SPECTROSCOPY TO STUDY THE ABSORPTION SPECTRUM OF ATMOSPHERIC GASES.
17698 APTIC NO. 35937

MALCHIKOVA T B
ABSORPTION OF NITROGEN OXIDES BY ACID SUSPENSION OF VANADIUM PENTOXIDE.
17341 APTIC NO. 35772

MALER A R
APPLYING A NEW METHOD FOR MEASURING BENZO(A)PYRENE IN VEHICLE EXHAUST TO THE STUDY OF FUEL FACTORS.
17078 APTIC NO. 35919

MALET L
TURBULENT DIFFUSION OF EFFLUENTS EMITTED CONTINUOUSLY INTO A STABLE ATMOSPHERE BY AN ELEVATED EMISSION SOURCE. VOLUME II (FIGURES).
17588 APTIC NO. 35203
TURBULENT DIFFUSION OF EFFLUENTS EMITTED CONTINUOUSLY INTO A STABLE ATMOSPHERE BY AN ELEVATED EMISSION SOURCE. VOLUME I (TEXT).
17589 APTIC NO. 35629

MALLETTE F S
STANDARDIZATION ASPECTS OF AIR POLLUTION CONTROL.
17845 APTIC NO. 35646

MALMGREN E N
GAS CARBURETION FOR INTERNAL COMBUSTION ENGINES.
*17313 APTIC NO. 35815

MALOV R V
REDUCING AIR POLLUTION FROM MINING EXPLORATION WITH DIESEL ENGINES.
17384 APTIC NO. 35756

MALY E
A METHOD FOR THE DETERMINATION OF POLYCYCLIC HYDROCARBONS IN AIR-BORNE PARTICULATES FROM URBAN AND OTHER ATMOSPHERES.
*17494 APTIC NO. 35319

MAMAYEV S A
SOME RESULTS OBTAINED IN URAL IN THE PROBLEM OF VEGETATION AND INDUSTRIAL POLLUTION.
*17809 APTIC NO. 35393

MAMMARELLA L
APPLICATION OF METEOROLOGICAL TRACERS FOR THE EXPERIMENTAL DETERMINATION OF AIR POLLUTANT DIFFUSION.
*17630 APTIC NO. 35829

MAMURO T
NEUTRON ACTIVATION ANALYSIS OF AIRBORNE DUST.
*17560 APTIC NO. 35828

MANCUSO T F
THE DISTRIBUTION OF CANCER MORTALITY IN OHIO.
*17751 APTIC NO. 35602

MANDE S S
SELECTION AND ADAPTATION OF A PROCESS FOR SULPHUR DIOXIDE REMOVAL FROM STACK GASES IN CONTACT SULPHURIC ACID PLANTS.
*17314 APTIC NO. 35881

MANI A
INTERESTING EVIDENCE OF STRATOSPHERIC DUST FROM ELECTRICAL CONDUCTIVITY MEASUREMENTS.
*17561 APTIC NO. 35823

MANNERING M C
A DUST COLLECTING APPARATUS OF SIMPLE CONSTRUCTION.
17495 APTIC NO. 35351

MANNERING M H
A DUST COLLECTING APPARATUS OF SIMPLE CONSTRUCTION.
*17495 APTIC NO. 35351

MANUCHARIAN R G
MEASUREMENT OF THE AVERAGE STRUCTURAL CHARACTERISTIC OF THE ATMOSPHERIC REFRACTIVE INDEX.
17619 APTIC NO. 35700

MARCH R E
BIOLUMINESCENCE AND SINGLET OXYGEN.
17799 APTIC NO. 36028

MARCHGRABER R M
THE DEVELOPMENT OF STANDARD INSTRUMENTS FOR RADIATION MEASUREMENTS.
*17631 APTIC NO. 35561

MARONI V A
LITHIUM/SULFUR CELLS AND THEIR POTENTIAL FOR VEHICLE PROPULSION.
17133 APTIC NO. 35539

MARTIN M
ACTION IN THE SMELTING INDUSTRY.
*17315 APTIC NO. 35093

MARTINEZ J R
FURTHER DEVELOPMENT OF THE PHOTOCHEMICAL SMOG MODEL FOR THE LOS ANGELES BASIN. (FINAL REPORT).
17602 APTIC NO. 35246

MARVER H S
ENZYMATIC CONVERSION OF BENZO(A)PYRENE. HYDROXYLATION VS DNA Binding.
17777 APTIC NO. 35345
THE DETERMINATION OF AMINOKETONES IN BIOLOGICAL FLUIDS.
*17752 APTIC NO. 35620

MARVOKA H
APPARATUS FOR REDUCING HYDROCARBON CONTENT OF ENGINE EXHAUST GASES DURING DECELERATION OF AUTOMOBILE.
17316 APTIC NO. 35316

MASAKI K
APPARATUS FOR REDUCING HYDROCARBON CONTENT OF ENGINE EXHAUST GASES DURING DECELERATION OF AUTOMOBILE.
*17316 APTIC NO. 35316
APPARATUS FOR REDUCING HYDROCARBON CONTENT OF ENGINE EXHAUST GASES DURING DECELERATION OF AUTOMOBILE.
*17317 APTIC NO. 35480

MASEK V
NEW DATA ON THE CHARACTERISTICS OF PARTICULATE EMISSIONS FROM A METALLURGICAL COKING PLANT.
*17113 APTIC NO. 35508

MASHITA T
WET TYPE DUST COLLECTORS.
*17318 APTIC NO. 35735

MASLYUKOVA A I
DETERMINATION OF THE AMOUNT (IN MICROGRAMS) OF BORON TRIFLUORIDE AND THE PRODUCTS OF ITS HYDROLYSIS IN THE AIR.
17514 APTIC NO. 35281

MASON R G
SOCIAL EFFECTS OF CHANGES IN AIR QUALITY.
*17901 APTIC NO. 35248

MASUDA Y
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

MATRAKHIN G A
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
17180 APTIC NO. 35478

MATSON W R
TIME VARIATIONS OF LEAD, COPPER AND CADMIUM CONCENTRATIONS IN AEROSOLS IN ANN ARBOR, MICHIGAN.
17549 APTIC NO. 35489

MATSUDA Y
NEUTRON ACTIVATION ANALYSIS OF AIRBORNE DUST.
17560 APTIC NO. 35828

MATSUE T
SOME PROBLEMS IN THE USE OF LPG FUEL FOR FOUR CYCLE ENGINES.
*17114 APTIC NO. 35998

MATSUMOTO K
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

MATSUMURA M
ESTIMATION OF AIR POLLUTANTS DEPOSITION ON INSULATOR BY CHEMICAL ANALYSES.
17824 APTIC NO. 35460

MATSUNO Y
PERFORMANCE ON ROTATIONAL VANE TYPE SCRUBBER.
*17319 APTIC NO. 35959

MATSUO K
SURVEY AND STUDY OF VARIOUS RESPIRATORY DISEASES WHICH WERE EXAMINED BY THE MEMBERS OF THE YOKKAICHI MEDICAL ASSOCIATION AND WERE THOUGHT TO HAVE BEEN INFLUENCED BY AIR POLLUTION.
*17753 APTIC NO. 35074

MATTHEWS K J
A WATER-COOLED SMOKE METER FOR THE ESTIMATION OF SOOT CONCENTRATIONS IN NATURAL GAS FLAMES.
*17496 APTIC NO. 35723

MAVROV L
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

MAXIMOVA V A
HYGIENIC ASSESSMENT OF THE PLANNING MEANS OF PROTECTION OF URBAN AIR FROM CONTAMINATION WITH MOTOR TRAFFIC DISCHARGES.
*17883 APTIC NO. 35988

MAYET A
CONTENT IN FORMALDEHYDE OF THE AIR IN DISSECTING ROOMS.
17568 APTIC NO. 35860

MAYO L H
SOCIAL IMPACT ANALYSIS: 1970.
*17902 APTIC NO. 35375

MCCABE L C
AIR POLLUTION REGULATIONS IN LOS ANGELES COUNTY.
*17115 APTIC NO. 35168
SANITARY ENGINEERING ASPECTS OF ATMOSPHERIC POLLUTION.
*17320 APTIC NO. 35595
ATMOSPHERIC POLLUTION.
*17116 APTIC NO. 35693

MCCALLA T M
AIR POLLUTION FROM AGRICULTURE.
17069 APTIC NO. 35564

MCCAULEY R F
THE PRESENT STATUS OF COMPOSTING AND ITS AIR POLLUTION ASPECTS.
*17117 APTIC NO. 35599

MCCAULL J
A LIFT FOR THE AUTO.
*17321 APTIC NO. 35127

MCCLATCHIE E A
A FLUORESCENT SOURCE NDIR CARBON MONOXIDE ANALYZER.
17490 APTIC NO. 35167

MCCLINTOCK M
STUDIES ON TECHNIQUES FOR SATELLITE SURVEILLANCE OF GLOBAL ATMOSPHERIC POLLUTION. (FINAL REPORT).
*17497 APTIC NO. 35713

MCCLURE G J
ELECTRON TRANSFER AND ION-ATOM INTERCHANGE IN C(+)-CO COLLISIONS.
17688 APTIC NO. 35323

MCCRONE W C
MICROSCOPY AND POLLUTION ANALYSIS.
*17498 APTIC NO. 35695

MCELROY W D
TITLE 45-PUBLIC WELFARE. CHAPTER VI-NATIONAL SCIENCE FOUNDATION. PART 640-ENVIRONMENTAL IMPACT STATEMENT POLICY AND PROCEDURES.
*17884 APTIC NO. 35523

MCGARRY J B
CENTRIFUGAL SEPARATORS.
17195 APTIC NO. 35740

MCJONES R W
NITROGEN OXIDES IN THE EXHAUST OF METHANE FUELED AUTOMOBILES.
*17118 APTIC NO. 35318

MCKEE H C
MEASUREMENT OF FUGITIVE DUST EMISSIONS AND VISIBLE EMISSIONS.
*17499 APTIC NO. 35657

MCKOY V
APPLICABILITY OF SCF THEORY TO SOME OPEN-SHELL STATES OF CO, N2, AND O2.
17690 APTIC NO. 35119

MCLELLAN A IV
STUDIES ON TECHNIQUES FOR SATELLITE SURVEILLANCE OF GLOBAL ATMOSPHERIC POLLUTION (FINAL REPORT).
17497 APTIC NO. 35713

MCMILLAN R E
PARTICLE SIZE DISTRIBUTIONS OF PARTICULATE ALUMINAS FROM COMPUTER-PROCESSED SEM IMAGES.
17529 APTIC NO. 35571

MCNAY B E
CURRENT SMELTING SYSTEMS AND THEIR RELATION TO AIR POLLUTION.
17082 APTIC NO. 35224

MCWADE D R
METHOD AND DEVICE FOR IMPROVED COMBUSTION OF AIR-FUEL MIXES IN INTERNAL COMBUSTION ENGINES.
*17322 APTIC NO. 35141

MEHLHORN H
VITAL CAPACITY AND FORCED INSPIRATION TEST IN SCHOOL CHILDREN OF THE FOURTH AND FIFTH GRADE FROM AREAS WITH DIFFERENT AIR HYGIENE CONDITIONS.
17739 APTIC NO. 35968

MELNIKOVA L V
DETERMINATION OF ATRAZINE, CYANURCHLORIDE, HYDROGEN CYANIDE AND ALIPHATIC AMINES IN THE AIR.
*17500 APTIC NO. 35136

MENZEL D B
OXIDATION OF BIOLOGICALLY ACTIVE REDUCING SUBSTANCES BY OZONE.
*17754 APTIC NO. 36003

MESSER P J
DETERMINATION OF GASEOUS AIR POLLUTION BY CARBON ADSORPTION.
17528 APTIC NO. 35598

METZLER D W
A STUDY OF ABSORPTION AND RETENTION OF LEAD IN WILD WATERFOWL IN RELATION TO CLINICAL EVIDENCE OF LEAD POISONING.
17792 APTIC NO. 35397

MEYER E L JR
EFFECTS OF EMISSION CHARACTERISTICS ON AIR QUALITY DURING SIMULATED AIR POLLUTION EPISODES.
*17632 APTIC NO. 35870

MEYER P B
COMPARATIVE MEASUREMENTS OF AIR POLLUTANTS IN THE IRON AND STEEL INDUSTRY OF FIVE MEMBER-COUNTRIES OF THE EUROPEAN COAL AND STEEL COMMUNITY.
*17501 APTIC NO. 35951

MIESSE C C
ENVIRONMENTAL ASPECTS OF SITE SELECTION FOR A PETROLEUM REFINERY.
17062 APTIC NO. 35887

MIHARA H
PROBLEMS IN POLLUTION CONTROL PROGRAMS: A SYMPOSIUM.
17894 APTIC NO. 35921

MILLAN M M
THE APPLICATIONS OF OPTICAL CORRELATION TECHNIQUES TO REMOTE SENSING OF SO2 PLUMES USING SKY LIGHT.
17502 APTIC NO. 35277

MILLER A
AROMATIC POLYCYCLIC HYDROCARBONS IN POLLUTED AIR AS INDICATORS OF CARCINOGENIC HAZARDS.
17464 APTIC NO. 35640

MILLER D R
REMOVE SULFUR FROM FUEL OIL AT LOWEST COST.
17200 APTIC NO. 35654

MILLS G A
GAS FROM COAL: FUEL OF THE FUTURE.
*17323 APTIC NO. 35517

MIMURA H
PROBLEMS IN POLLUTION CONTROL PROGRAMS: A SYMPOSIUM.
17894 APTIC NO. 35921

MINET R G
A TECHNOLOGICAL SOLUTION TO AIR POLLUTION PROBLEMS - SYNTHETIC FUEL.
*17119 APTIC NO. 35236

MISHURIN YA V
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
17180 APTIC NO. 35478

MITCHELL E R
EFFECT OF FUEL CHARACTERISTICS AND EXCESS COMBUSTION AIR ON SULPHURIC ACID FORMATION ON A PULVERIZED-COAL-FIRED BOILER.
17108 APTIC NO. 35338
CONTROL OF SO3 IN LOW-PRESSURE HEATING BOILERS BY AN ADDITIVE.
17304 APTIC NO. 35721

MIYAJIMA H
TREATMENT OF EMISSION GAS FROM RECOVERY BOILERS.
*17324 APTIC NO. 35803

MIYAKE T
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE. AS CONCLUSION FROM 1965 TO 1971.
17557 APTIC NO. 35116

MIYAMOTO K
PROBLEMS IN POLLUTION CONTROL PROGRAMS: A SYMPOSIUM.
17894 APTIC NO. 35921

MIYAZAKI S
SO2 SCRUBBER FOR PULP AND PAPER MILL.
*17325 APTIC NO. 35931

MIZOGUCHI M
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

MIZOHATA A
NEUTRON ACTIVATION ANALYSIS OF AIRBORNE DUST.
17560 APTIC NO. 35828

MIZUTORI T
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923

MOEBIUS R
A FILTER PAD FOR THE FILTRATION OF GASES AND OF LIQUIDS.
17210 APTIC NO 35103

MOELLER D W
SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

MOFFAT A J
THE APPLICATIONS OF OPTICAL CORRELATION TECHNIQUES TO REMOTE SENSING OF SO2 PLUMES USING SKY LIGHT.
*17502 APTIC NO. 35277

MOFFITT A E JR
A RAPID METHOD EMPLOYING IMPREGNATED CHARCOAL AND ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR THY DETERMINATION OF MERCURY.
*17503 APTIC NO. 35840

MOGENSEN A
RELATIVE TRANSPIRATION OF CONIFEROUS AND BROAD-LEAVED TREES IN AUTUMN AND WINTER.
17817 APTIC NO. 35229

MOHNEN V A
AIR QUALITY OF AMERICAN HOMES.
17566 APTIC NO. 35941

MOLENAT J
DISPERSION OF POLLUTANTS AND THE MICROCLIMATE AT LACQ.
17582 APTIC NO. 35702

MOLOKHIA M M
TRACE ELEMENTS IN THE LUNG.
*17755 APTIC NO. 35453

MONCRIEFF A A
LEAD POISONING IN CHILDREN.
*17756 APTIC NO. 35462

MONKMAN J L
TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD).
17515 APTIC NO. 35727
CONTINUOUS DETERMINATION OF CARBON MONOXIDE BY FRONTAL ANALYSIS.
17462 APTIC NO. 35894

MOORE A
ROUND DOWNDRAUGHT KILNS: CONVERSION TO GAS FIRING.
*17120 APTIC NO. 35547

MOORE H
THE EFFECTS OF LEAD, MERCURY, AND GOLD ON THE POTASSIUM TURNOVER OF RABBIT BLOOD CELLS.
17746 APTIC NO. 35218

MOORMAN W J
SWIMMING AS A LABORATORY METHOD FOR EXERCISING DOGS.
17670 APTIC NO. 35683

MORGAN G B
MONITORING ATMOSPHERIC POLLUTANTS.
*17885 APTIC NO. 35389
ATMOSPHERIC SURVEILLANCE: THE CURRENT STATE OF AIR MONITORING TECHNOLOGY.
17479 APTIC NO. 35320

MORGAN J M
CHRONIC LEAD INGESTION AND GOUT.
17707 APTIC NO. 35211
A SIMPLIFIED SCREENING TEST FOR EXPOSURE TO LEAD.
*17757 APTIC NO. 35217

MORGAN P W
ABSCISSION. THE ROLE OF ETHYLENE MODIFICATION OF AUXIN TRANSPORT.
17789 APTIC NO. 35062

MORI Y
HISTOPATHOLOGICAL STUDIES OF PARANASAL SINUSES OF GERM-FREE GUINEA PIG EXPOSED TO SULFUR DIOXIDE GAS (SO2).
17744 APTIC NO. 35153

MORIKAWA K
MANUFACTURING METHOD OF HIGHLY ACTIVE PALLADIUM-CARBON CATALYST.
17377 APTIC NO. 35047

MORIWAKE S
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE. AS CONCLUSION FROM 1965 TO 1971.
17557 APTIC NO. 35116

MORRIS C W
INTERNAL COMBUSTION ENGINE EXHAUST GAS TREATMENT APPARATUS AND METHOD.
*17326 APTIC NO. 35551

MORSE R I
PHOTOFRAGMENT SPECTROMETER.
17447 APTIC NO. 35179

MOSCHELLA R
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

MOSER C E
AUTOMOTIVE EMISSIONS RESEARCH AND THE COORDINATING RESEARCH COUNCIL PROGRAM.
*17121 APTIC NO. 35474

MOUM S G
A METHOD FOR THE TREATMENT OF ANIMAL WASTES TO CONTROL AMMONIA AND OTHER ODORS.
17131 APTIC NO. 35673

MOUNTFORD M D
POPULATION SURVIVAL IN A VARIABLE ENVIRONMENT.
*17810 APTIC NO. 35810

MOYERS J L
GASEOUS BROMINE AND PARTICULATE LEAD, VANADIUM, AND BROMINE IN A POLLUTED ATMOSPHERE.
*17562 APTIC NO. 35861

MUELLER P K
STATUS OF MEASURING AIR QUALITY.
17526 APTIC NO. 35984

MUHLRAD W
THE FORMATION OF ACID MISTS: USUAL METHODS OF REMOVAL. A NEW SOAKED FABRIC PROCESS.
*17327 APTIC NO. 35674

MUKAI M
FATE OF ARENES INCORPORATED WITH AIRBORNE SOOT.
17654 APTIC NO. 35604

MULLEN R E
SIGNIFICANCE OF ATMOSPHERIC DUST AND ICE RAFTING FOR ARCTIC OCEAN SEDIMENT.
*17633 APTIC NO. 35928

MURAMATSU K
STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL2O3.
17294 APTIC NO. 36007

MURAMATSU Y
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

MURATA M
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

MURPHY J J
DETERMINATION OF MERCURY BY A COMBUSTION TECHNIQUE USING GOLD AS A COLLECTOR.
17431 APTIC NO. 35826

MURPHY R L H
HAZARDS TO HEALTH: DO IT YOURSELF POLYURETHANE FOAM.
17126 APTIC NO. 35278

MUSSERSKAYA A N
EXPERIENCE IN DETERMINING THE TOTAL AMOUNT OF GAS RELEASED FROM OPEN SURFACES OF WASTE WATER TREATMENT INSTALLATIONS OF MODERN OIL PROCESSING PLANTS.
*17563 APTIC NO. 35130

MYERS A L
KINETIC MODEL OF PHOTOCHEMICAL SMOG FORMATION.
17610 APTIC NO. 35075

MYERS J N
FOG.
*17634 APTIC NO. 35644

MYERS P S
THE ABCS OF ENGINE EXHAUST EMISSIONS.
*17328 APTIC NO. 35049

THE 1970 CLEAN AIR CAR RACE AND THE UNIVERSITY OF WISCONSIN ENTRIES.
17125 APTIC NO. 35484

N

NADER J S
DIRECT-READING INSTRUMENTS FOR ANALYZING AIRBORNE GASES AND VAPORS.
*17504 APTIC NO. 35623

NAGAI T
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923

STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

NAKAMURA H
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

NAKAMURA T
DEVELOPMENT OF APPARATUS FOR DESULFURIZING WASTE GAS FROM SINTERING OPERATIONS IN THE STEEL INDUSTRY.
*17329 APTIC NO. 35962

NAKAMURA Y
SURVEY FOR DRUGS PURCHASED BY THE PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AT HIS OWN EXPENSE.
17759 APTIC NO. 35110

NAKAYAMA T
SURVEY AND STUDY OF VARIOUS RESPIRATORY DISEASES WHICH WERE EXAMINED BY THE MEMBERS OF THE YOKKAICHI MEDICAL ASSOCIATION AND WERE THOUGHT TO HAVE BEEN INFLUENCED BY AIR POLLUTION.
17753 APTIC NO. 35074

NARITA K
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

NARUMI K
ESTIMATION OF AIR POLLUTANTS DEPOSITION ON INSULATOR BY CHEMICAL ANALYSES.
17824 APTIC NO. 35460

NASR A N M
CELLULAR BIOCHEMICAL RESPONSE TO OZONE INHALATION: AN EXPERIMENTAL METHOD FOR THE STUDY OF THE TOXICITY OF AIR POLLUTANTS.
*17758 APTIC NO. 35360

NAZARIO E
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

NELSON W G
CORRECTION OF ANISOKINETIC SAMPLING ERRORS.
*17505 APTIC NO. 35269

NETSCHERT B C
THE ECONOMIC IMPACT OF ELECTRIC VEHICLES.
*17122 APTIC NO. 35584

NEUMANN G M
A POCKET FILTER FOR AIR AND GAS PURIFICATION CONSISTING OF A BATTERY OF SINGLE ELEMENTS.
*17330 APTIC NO. 35102

NEWHALL H K
THE ABCS OF ENGINE EXHAUST EMISSIONS.
17328 APTIC NO. 35049

NICHOLS R A
CONTROL OF EVAPORATION LOSSES IN GASOLINE MARKETING OPERATIONS.
*17331 APTIC NO. 35787

NICKOLA P W
ATMOSPHERIC TRACER TECHNIQUE EMPLOYING KR 85 AND USE OF THIS TECHNIQUE IN DEFINING PUFF DIMENSIONS AND TRANSPORT SPEED.
*17635 APTIC NO. 35482

NICOLAI L A
REMOVE SULFUR FROM FUEL OIL AT LOWEST COST.
17200 APTIC NO. 35654

NIELSEN J P
THE MARKINGS PRODUCED BY VARIOUS AIR POLLUTANTS ON LEAVES.
17787 APTIC NO. 35613

NIKI H
AN OZONE-NO CHEMILUMINESCENCE METHOD FOR NO ANALYSIS IN PISTON AND TURBINE ENGINES.
*17506 APTIC NO. 35607

NIKLASSON R
AIR CLEANING - NO UTOPIA ANY LONGER. REPORT ON THIS YEAR S ELMIA EXHIBITION.
*17123 APTIC NO. 35113

NISHIKATA H
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

NISHIMURA A
SURVEY AND STUDY OF VARIOUS RESPIRATORY DISEASES WHICH WERE EXAMINED BY THE MEMBERS OF THE YOKKAICHI MEDICAL ASSOCIATION AND WERE THOUGHT TO HAVE BEEN INFLUENCED BY AIR POLLUTION.
17753 APTIC NO. 35074

NISHIMUTA T
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

NISHIYAMA R
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923

STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

NISHIZAKI S
CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.
17301 APTIC NO. 35920

NITSCHE I
CONTENT IN FORMALDEHYDE OF THE AIR IN DISSECTING ROOMS.
17568 APTIC NO. 35860

NOMURA Y
EXPERIMENTAL STUDIES ON SMOKE HEIGHT OF STACK GASES.
*17636 APTIC NO. 35745

NORDEN H
ANALYTICAL CONSIDERATIONS CONCERNING THE HEATING SECTOR. (II).
*17332 APTIC NO. 36001

O

ODAIRA T
AIR POLLUTION CONTROL IN TOKYO.
*17564 APTIC NO. 35150

OELSCHLAEGER W
THE PROBLEMS OF EMISSION MEASUREMENTS OF FLUORINE CONCERNING THE EFFECTS ON PLANT AND ANIMAL.
*17811 APTIC NO. 35992

OGAWA K
STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL203.
17294 APTIC NO. 36007

OGAWA M
STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL203.
17294 APTIC NO. 36007

OGLESBY S JR
ELECTROSTATIC PRECIPITATION.
*17333 APTIC NO. 35793

OGUCHI Y
HYDRODESULFURIZATION OF HEAVY PETROLEUM HYDROCARBON OIL IN A FLUIDIZED REACTION ZONE.
*17334 APTIC NO. 35349

OHLMEYER M
GAS FILTER ARRANGEMENT.
*17335 APTIC NO. 35148

OIWA T
AN APPARATUS FOR DISARMING SULFUR OF SOOT AND SMOKE EXHAUST FROM AN OIL FIRED BOILER THAT HEATS A BUILDING.
*17336 APTIC NO. 35969

OKADA H
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE. AS CONCLUSION FROM 1965 TO 1971.
17557 APTIC NO. 35116

OKAMOTO S
A STUDY ON THE RELATION BETWEEN AIR POLLUTANTS CONCENTRATION AND AIR PRESSURE DISTRIBUTIONS.
17648 APTIC NO. 35991

OKAMOTO Y
SURVEY FOR DRUGS PURCHASED BY THE PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AT HIS OWN EXPENSE.
*17759 APTIC NO. 35110

OLEJNIK L J
MOBILE TEST VEHICLE MEASURES EXHAUST EMISSIONS ON THE ROAD.
17064 APTIC NO. 35994

OLIN J G
PIEZOELECTRIC MICROBALANCE FOR MONITORING THE MASS CONCENTRATION OF SUSPENDED PARTICLES.
ERROR

OLSZOWSKI J
THE INFLOW OF AIR POLLUTION UPON THE GROWTH OF A COMMON PINE-TREE AND A BLACK PINE-TREE.
17797 APTIC NO. 35259

ONDA M
THE BASIC THINKING CONCERNING PUBLIC NUISANCE CONTROL MEASURES.
*17886 APTIC NO. 35527

ONIKUL R I
ANALYSIS OF CONCENTRATION RANGE OF A HEAVY CONTAMINANT ON THE BASIS OF DATA FROM A 300-METRE HIGH METEOROLOGIC TOWER.
17591 APTIC NO. 35409

ONISHI S
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

OOTAKI A
A STUDY ON THE RELATION BETWEEN AIR POLLUTANTS CONCENTRATION AND AIR PRESSURE DISTRIBUTIONS.
17648 APTIC NO. 35991

ORY H A
POSSIBLE EFFECTS OF ATMOSPHERIC PARTICLES ON FIREBALL EMISSIONS.
*17637 APTIC NO. 35610

OSHIMA H
SURVEY ON MORBIDITY, MORTALITY, MEDICAL EXAMINATION OF THE RESIDENTS, AND MEDICAL EXAMINATION OF SCHOOL CHILDREN AND APPROVED VICTIMS OF ENVIRONMENTAL HAZARD.
17733 APTIC NO. 35099
PATHOLOGICAL STUDY CONCERNING RESPIRATORY PHYSIOLOGY AND SEROLOGICAL STUDY OF VICTIMS OF POLLUTIONS. (PART 2) OBSTRUCTIVE RESPIRATORY DISEASES DUE TO AIR POLLUTION AND CONCENTRATION OF BLOOD PLASMA HISTAMINE.
*17760 APTIC NO. 35506

OSHIO T
PROBLEMS IN POLLUTION CONTROL PROGRAMS: A SYMPOSIUM.
17894 APTIC NO. 35921

OTANI A
ENGINE EXHAUST GAS RECOMBUSTION APPARATUS.
17407 APTIC NO. 35915

OTANI J
AFTERBURNER APPARATUS FOR ENGINE EXHAUST GAS.
17406 APTIC NO. 35290

OTVAGINA M I
PRODUCTION OF SULFURIC ACID FROM REVERBERATORY FURNACE FLUE GASES.
*17337 APTIC NO. 35333

OWENS J C
OPTICAL DOPPLER MEASUREMENT OF MICROSCALE WIND VELOCITY.
*17638 APTIC NO. 35624

OZOLINS G
MONITORING ATMOSPHERIC POLLUTANTS.
17885 APTIC NO. 35389

P

PADRTA F G
POLYNUCLEAR AROMATICS IN AUTOMOBILE EXHAUST.
*17124 APTIC NO. 35818

PADVA Y YU
THE DISTRIBUTION OF AEROSOL CONCENTRATIONS IN A TURBULENT GAS STREAM.
*17689 APTIC NO. 35329

PAGE A L
LEAD QUANTITIES IN PLANTS, SOIL, AND AIR NEAR SOME MAJOR HIGHWAYS IN SOUTHERN CALIFORNIA.
*17812 APTIC NO. 35827

PAMPATTIWAR V L
SHORT-TERM AIR QUALITY SURVEYS IN 4 MAJOR CITIES OF INDIA.
17573 APTIC NO. 35534

PANCHENKOV G M
UTILIZATION OF SULFUR DIOXIDE FROM INDUSTRIAL WASTES.
17265 APTIC NO. 35133

PARKER A
WHAT S IN THE AIR? J. Inst. Fuel, 40(315):173-175, April 1967. (Presented at the Fuel Luncheon Club, Dec. 20, 1966.)
*17887 APTIC NO. 35872

AN AUTOMATIC CONTROL SYSTEM FOR DIRECT COMPARISONS OF AIR POLLUTION ABATEMENT EQUIPMENT.
*17338 APTIC NO. 35927

PARNYUK N I

A SPECTROCHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF MICROCONTAMINANTS IN GASES.
17520 APTIC NO. 35327

PARR J F

VOLATILIZATION OF SOIL-APPLIED DDT AND DDD FROM FLOODED AND NONFLOODED PLOTS.
17571 APTIC NO. 35082

PARR M K

A WATER-COOLED SMOKE METER FOR THE ESTIMATION OF SOOT CONCENTRATIONS IN NATURAL GAS FLAMES.
17496 APTIC NO. 35723

PARRY R H

THE ACTIVATED CARBON INDUSTRY.
17356 APTIC NO. 35645

PARTANEN T

CROSS-CORRELATIONS IN TIME SERIES OF SOME PARTICLE FALL COMPONENTS ON RELATION TO URBAN AREA TYPE.
17559 APTIC NO. 35940

PARTSEF D P

EXPERIMENTAL INVESTIGATION OF THE BIOLOGICAL EFFECT OF MICROCONCENTRATIONS OF PENTANE AND HEXANE MIXTURE IN THE AIR.
17714 APTIC NO. 35760

PASQUILL F

THE ESTIMATION OF THE DISPERSION OF WINDBORNE MATERIAL.
*17639 APTIC NO. 35414

PATE J B

TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS).
17426 APTIC NO. 35728

PATRICK A D

LEAD POISONING IN CHILDREN.
17756 APTIC NO. 35462

PATTERNE D

RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

PATTISON J N

GAS ANALYZER.
17485 APTIC NO. 35337

PATZELT K

INVESTIGATION ABOUT THE EFFECTS OF A SINGLE INTRATRACHEAL APPLICATION OF APATITE-NEPHELINE AND APATITE-CONCENTRATE DUST TO RAT LUNGS.
17743 APTIC NO. 35973

PAVLITSIYAN T

POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

PECHKOVSKII V V

DRY LIME METHOD FOR REMOVING SULFUR DIOXIDE FROM FUEL GASES IN A THERMOELECTRIC POWER PLANT. V. REACTION OF CALCIUM OXIDE WITH SULFUR DIOXIDE.
17286 APTIC NO. 35487

PENNEY G W

INFLUENCE OF MECHANICAL COLLECTION ON ELECTROSTATIC PRECIPITATOR SPARKOVER VOLTAGE - A LABORATORY SIMULATION.
*17339 APTIC NO. 35471

PERCY L E

THE TRITILOG AND ITS APPLICATION TO CONTINUOUS MEASUREMENT OF SULFUR CONCENTRATION IN STREAMS. PART II: FIELD APPLICATIONS.
17433 APTIC NO. 35642

PERLROTH M G

THE DETERMINATION OF AMINOKETONES IN BIOLOGICAL FLUIDS.
17752 APTIC NO. 35620

PEROV O V

THE CYTOTOXICITY OF INHALED HYDROCARBONS AEROSOL OF THE HEAVY COAL FRACTION.
*17761 APTIC NO. 35331

PERSIANI C

THE DETECTION OF SELECTED AIR POLLUTANTS USING A LABORATORY NEUTRON GENERATOR.
*17508 APTIC NO. 35518

PETERS B

THE 1970 CLEAN AIR CAR RACE AND THE UNIVERSITY OF WISCONSIN ENTRIES.
*17125 APTIC NO. 35484

PETERS J M

HAZARDS TO HEALTH: DO IT YOURSELF POLYURETHANE FOAM.
*17126 APTIC NO. 35278

PETRICK M

A CRITIQUE OF MHD POWER GENERATION.
17092 APTIC NO. 35472

PICKTHALL D

USE OF FIBREGLASS REINFORCED PLASTICS IN A BOILERHOUSE CHIMNEY.
17100 APTIC NO. 35057

PIEPENBRINK W

PHOTO-ELECTRONIC SMOKE DENSITY METER.
*17509 APTIC NO. 35485

PIERRARD J M

AUTO EXHAUST – LEAD VS AROMATICS.
*17127 APTIC NO. 35123

PIETA J

SOME MORPHOLOGICAL VARIATIONS OF THE NEEDLES AND SHOOTS OF SCOTS PINE/PINUS SILVESTRIS L./ IN THE POLLUTED SURROUNDINGS OF NITROGEN PLANT AT PULAWY.
17800 APTIC NO. 35185

PILAT M J

SIZE DISTRIBUTION OF AEROSOLS FROM A KRAFT MILL RECOVERY FURNACE.
17541 APTIC NO. 35051

PILE G

ACTION BY THE OIL INDUSTRY.
*17340 APTIC NO. 35086

PITTS J N

NITROGEN DIOXIDE CATALYZED CIS-TRANS ISOMERIZATION OF CIS-2 BUTENE.
17694 APTIC NO. 36016

PITTS J N JR

CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES.
17488 APTIC NO. 35091

CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES.
17489 APTIC NO. 35491

PLAKS N

IMPROVED PROCESSING METHODS FOR CONTROL OF AIR POLLUTION EMISSIONS FROM COKEMAKING.
*17839 APTIC NO. 35390

PLOTKIN S E

CONTROLLING AIR QUALITY: ST. LOUIS CASE STUDY.
*17888 APTIC NO. 35423

SOME APPLICATIONS OF THE IMPLEMENTATION PLANNING PROGRAM.
17881 APTIC NO. 35464

PLUMLEY A L

TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS).
17426 APTIC NO. 35728

POGREBNAYA V L

ABSORPTION OF NITROGEN OXIDES BY ACID SUSPENSION OF VANADIUM PENTOXIDE.
*17341 APTIC NO. 35772

POLKOWSKI L B

IDENTIFYING ODOROUS COMPONENTS OF STORED DAIRY MANURE.
17436 APTIC NO. 35865

POPOV I

POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

PORTERFIELD J D

THE DISTRIBUTION OF CANCER MORTALITY IN OHIO.
17751 APTIC NO. 35602

PORTIG W H
ENVIRONMENTAL DATA BASE FOR REGIONAL STUDIES IN THE HUMID TROPICS. (FINAL REPORT).
17545 APTIC NO. 35392

POST N K
AIR POLLUTION AND TOTAL ENVIRONMENTAL HEALTH.
•17342 APTIC NO. 35706

POVEY J H
CATALYTIC INCINERATION CUTS METAL LITHOGRAPHY AIR POLLUTION.
•17343 APTIC NO. 35043

PRAGER M J
POLLUTION MONITORING BY FLAME EMISSION SPECTROSCOPY.
•17510 APTIC NO. 35313
DETECTION OF TOXIC ORANOPHOSPORUS AIRBORNE SUBSTANCES BY FRUSTATED MULTIPLE INTERNAL REFLECTION SPECTROSCOPY.
17512 APTIC NO. 35348

PRATER W K
PRESENT STATUS OF ELECTROMAGNETIC SEPARATION OF STABLE ISOTOPES AT THE OAK RIDGE NATIONAL LABORATORY.
17308 APTIC NO. 35653

PROBALD F
DIURNAL VARIATION OF THE TEMPERATURE DIFFERENCES BETWEEN DOWNTOWN AND SUBURBAN STATIONS IN BUDAPEST.
•17640 APTIC NO. 35618

PROFFITT T O
VARIATIONS IN DAILY SOLAR RADIATION AT NATIONAL WEATHER SERVICE OBSERVING SITES IN TEXAS.
•17641 APTIC NO. 35458

PROHAZKA G J
CHEMICAL RECOVERY FURNACE WITH AIR CASCADE EVAPORATORY SYSTEM.
17232 APTIC NO. 35315

PROSPERO J M
PESTICIDES IN THE LOWER ATMOSPHERE OF THE NORTHERN EQUATORIAL ATLANTIC OCEAN.
17567 APTIC NO. 36020

PURDAM I
AUSTRALIAN SERVICE EXPERIENCE WITH POLLUTION OF HIGH VOLTAGE INSULATION.
17825 APTIC NO. 35479

PURSE F V
I-C ENGINE EXHAUST GAS AFTERBURNER AIR CONTROL.
17248 APTIC NO. 35300

PURTYMUN W D
LOS ALAMOS ENVIRONMENTAL MONITORING PROGRAM. JULY THROUGH DECEMBER 1970.
17556 APTIC NO. 35407

PYLE W R
GASOLINE LEAD ADDITIVES -- A BALANCED VIEWPOINT.
17264 APTIC NO. 35816

Q

QUINIO R L
RESULTS OF FULL SCALE ATMOSPHERIC DIFFUSION EXPERIMENTS.
•17642 APTIC NO. 35064

R

RABEN I A
A REPORT ON THE EPA ALKALI SCRUBBING TEST FACILITY.
•17344 APTIC NO. 35898

RABENHORST H
GAS ANALYZER.
17463 APTIC NO. 35514

RADOYEVA G
APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS IN STUDYING THE REGENERATION PROCESS OF A LOW-TEMPERATURE CATALYST UTILIZED FOR THE CONVERSION OF CARBON MONOXIDE.
17365 APTIC NO. 35755

RAMAN A K S
APPLICATION OF CATALYSTS TO AUTOMOTIVE NOX EMISSIONS CONTROL.
17197 APTIC NO. 35223

RAMAN S K
SELECTION AND ADAPTATION OF A PROCESS FOR SULPHUR DIOXIDE REMOVAL FROM STACK GASES IN CONTACT SULPHURIC ACID PLANTS.
17314 APTIC NO. 35881

RAMSDELL J V JR
ATMOSPHERIC TRACER TECHNIQUE EMPLOYING KR 85 AND USE OF THIS TECHNIQUE IN DEFINING PUFF DIMENSIONS AND TRANSPORT SPEED.
17635 APTIC NO. 35482

RASMUSSEN R E
ENZYMATIC CONVERSION OF BENZO(A)PYRENE. HYDROXYLATION VS DNA Binding.
17777 APTIC NO. 35345

RAVENEY F J
TOXIC GASES IN TOWER SILOS.
17544 APTIC NO. 35501

RAY B J
LEAD AND BROMINE IN ATMOSPHERIC PARTICULATE MATTER ON OAHU, HAWAII.
17553 APTIC NO. 35725

REBIERE A
LEGISLATION AND IMPLEMENTATION IN THE FIELD OF ATMOSPHERIC POLLUTION.
•17889 APTIC NO. 35114

RECKNER L R
EXHAUST EMISSIONS OF LIGHT AIRCRAFT.
17152 APTIC NO. 35220
THE COMPOSITION AND ODOR OF DIESEL EXHAUST.
•17128 APTIC NO. 35635

REDMOND J P
VAPOR PHASE IMPREGNATION OF ACTIVE CARBONS. QUARTERLY PROGRAM REPORT NO. 1 JANUARY THROUGH MARCH 1969.
17184 APTIC NO. 35687

REED L E
THE REMOVAL OF SULPHUR DIOXIDE FROM FLUE GAS.
•17345 APTIC NO. 35178

REEVES A L
COLLAGEN BIOSYNTHESIS IN RAT LUNGS DURING EXPOSURE TO ASBESTOS.
17724 APTIC NO. 35308

REID D D
THE NATURAL HISTORY OF CHRONIC BRONCHITIS.
•17762 APTIC NO. 35588

REINERT R A
VEGETATION INJURY FROM THE INTERACTION OF NITROGEN DIOXIDE AND SULFUR DIOXIDE.
17815 APTIC NO. 35192
EFFECT OF LOW CONCENTRATIONS OF OZONE AND SULFUR DIOXIDE ON FOLIAGE, GROWTH AND YIELD OF RADISH.
17816 APTIC NO. 35929

REINHARDT G W
PHOTOOXIDATION OF SULFUR DIOXIDE.
17649 APTIC NO. 35856

REIST P C
SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

REITAN C H
AN ASSESSMENT OF THE ROLE OF VOLCANIC DUST IN DETERMINING MODERN CHANGES IN THE TEMPERATURE OF THE NORTHERN HEMISPHERE.
•17643 APTIC NO. 35371

REMILLIEUX J
THE FORMATION OF ACID MISTS: USUAL METHODS OF REMOVAL. A NEW SOAKED FABRIC PROCESS.
17327 APTIC NO. 35674

RENWICK A G C
LEAD POISONING IN CHILDREN.
17756 APTIC NO. 35462

REYNOLDS L T
A RELAY CONTROL TO IMPROVE OPERATION OF AISI-TYPE AUTOMATIC AIR SAMPLERS.
•17511 APTIC NO. 35542

RIBAUDO C
A LABORATORY STUDY OF AN EXTRACTION SYNTHESIS TECHNIQUE FOR THE ELIMINATION OF POLLUTANTS FROM THE MAHON FOG FILTER WATERS AT TNT PLANTS.
17135 APTIC NO. 35655

RICE R L
FLUID BED COMBUSTION: SUITABILITY OF COALS AND BED MATERIALS.
*17129 APTIC NO. 35292

RIEHL H
LARIMER COUNTY, COLORADO, AIR POLLUTION AND OUTLOOK.
*17644 APTIC NO. 35368

RIHM A JR
STATE AND LOCAL AGENCY PARTICIPATION IN FEDERAL AIR QUALITY CONTROL REGIONS.
*17890 APTIC NO. 35983

RINEHART G S
EVIDENCE FOR SULFATE AS A MAJOR CONDENSATION NUCLEUS CONSTITUENT IN NONURBAN FOG.
*17645 APTIC NO. 35204

RIPPERTON L A
ORGANIC MATTER IN MARINE LIGHT-SCATTERING AEROSOLS. (FINAL REPORT).
*17565 APTIC NO. 35367
TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD).
17515 APTIC NO. 35727

RO S T
REFERENCE VALUES OF THE VISCOSITY OF TWELVE GASES AT 25 C.
17685 APTIC NO. 35143

ROBERTS G E
LEAD POISONING IN CHILDREN.
17756 APTIC NO. 35462

ROBERTS L M
ELECTROSTATIC GAS CLEANING.
*17346 APTIC NO. 35498

ROBINSON M
ELECTRICALLY SUPPORTED LIQUID COLUMNS IN HIGH-PRESSURE ELECTROSTATIC PRECIPITATORS.
*17347 APTIC NO. 35521

ROLLS G C
DEVELOPMENT OF A TEST FACILITY AND SPECIFICATION FOR BREATHABLE AIR FILTERS. (FINAL REPORT).
17306 APTIC NO. 35251

ROMANOVSKY J C
DISCUSSION OF NATIONAL AIR QUALITY STANDARDS FOR AUTOMOTIVE POLLUTANTS: A CRITICAL REVIEW.
17837 APTIC NO. 35384

RON T
MICROWAVE ABSORPTION AND POTENTIAL BARRIER FOR ORIENTATION. SULFUR DIOXIDE ADSORBED ON SODIUM CHLORIDE AND POTASSIUM CHLORIDE.
*17348 APTIC NO. 35069

ROSA C N L
DETECTION OF TOXIC ORANOPHOSPORUS AIRBORNE SUBSTANCES BY FRUSTATED MULTIPLE INTERNAL REFLECTION SPECTROSCOPY.
*17512 APTIC NO. 35348

ROSE J B
APPLICABILITY OF SCF THEORY TO SOME OPEN-SHELL STATES OF CO, N2, AND O2.
*17690 APTIC NO. 35119

ROSSANO A T
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180

ROSSANO A T JR
CONTINUOUS SOURCE MONITORING OF GASEOUS SULFUR COMPOUNDS IN THE PAPER INDUSTRY.
17453 APTIC NO. 35243
SOURCE TESTING FOR AIR POLLUTION CONTROL.
17454 APTIC NO. 35956

ROSSLER F
DETERMINATION OF THE ABSORPTION COEFFICIENTS OF SOOT PARTICLES OF VARIOUS FLAMES.
*17691 APTIC NO. 35556

ROTH J F
COPPER-BASED AUTO EXHAUST CATALYSTS: MECHANISMS OF DEACTIVATION AND PHYSICAL ATTRITION.
*17349 APTIC NO. 35814

ROTH L
AIR POLLUTION IN THE PULP AND PAPER INDUSTRY.
17149 APTIC NO. 35581

ROY A K
NUCLEUS RICHNESS OF CLOUD AIR AND RAINABILITY OF CLOUDS.
*17646 APTIC NO. 35282

RUCKELSHAUS W D
WILL AIR POLLUTION REGULATIONS CHANGE COMMUTING PATTERNS? Civil Eng. N. Y.), 41(9):86-87, Sept. 1971. 3 refs.
*17350 APTIC NO. 35117
ENVIRONMENTAL PROTECTION AGENCY. NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS.
*17840 APTIC NO. 35734
LIGHT DUTY VEHICLE EMISSION STANDARDS. TECHNOLOGY FEASIBILITY.
*17841 APTIC NO. 35805
TITLE 40 -- PROTECTION OF ENVIRONMENT. CHAPTER I -- ENVIRONMENTAL PROTECTION AGENCY. SUBCHAPTER C -- AIR PROGRAMS. PART 60 -- STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES.
*17842 APTIC NO. 35974
TITLE 40-PROTECTION OF ENVIRONMENT CHAPTER I-ENVIRONMENTAL PROTECTION AGENCY. PART 85 - CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLE AND NEW MOTOR VEHICLE ENGINES.
*17843 APTIC NO. 35982

RUMPF H
A CRITICAL OBSERVATION ON METHODS FOR ANALYSIS OF THE SIZES OF FINE PARTICLES.
*17513 APTIC NO. 35627

RUPE J H
NITRIC OXIDE EMISSION STUDIES OF INTERNAL COMBUSTION ENGINES.
17132 APTIC NO. 35852

RYAZANOVA V A
MAXIMUM PERMISSIBLE CONCENTRATIONS OF NOXIOUS SUBSTANCES IN THE ATMOSPHERIC AIR OF POPULATED AREAS.
*17844 APTIC NO. 35406

RYU S
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

S

SACHS L
ENZYMATIC HYDROXYLATION OF BENZOPYRENE AND ITS RELATIONSHIP TO CYTOTOXICITY.
17676 APTIC NO. 35639

SADILOVA M S
REFLEX REACTIONS OF AN ORGANISM UNDER THE EFFECT OF HF, NAF AND ALF3.
*17763 APTIC NO. 35670

SADO I
INCINERATOR WITH A DUST COLLECTION DEVICE.
*17351 APTIC NO. 35765

SADOVSKIY B F
SOME CHEMICAL AND COLLOIDAL PROPERTIES OF CURING SMOKE.
17686 APTIC NO. 35239

SAKUMA J
CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.
17301 APTIC NO. 35920

SAKURADA S
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

SAKURAI N
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

SALEEM A
DESULPHURIZATION OF FLUE GAS.
*17352 APTIC NO. 36025

SALYAMON G S
DETERMINATION OF THE AMOUNT (IN MICROGRAMS) OF BORON TRIFLUORIDE AND THE PRODUCTS OF ITS HYDROLYSIS IN THE AIR.
*17514 APTIC NO. 35281

SAMSON P C
POLYNUCLEAR AROMATICS IN AUTOMOBILE EXHAUST.
17124 APTIC NO. 35818

SAROFIM A F
NITRIC OXIDE FORMATION IN PREMIXED AND DIFFUSION FLAMES.
17150 APTIC NO. 35214

SATO A
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

SATO S
THE EXHAUST GAS ANALYSIS OF THE AUTOMOTIVE ENGINE EQUIPPED WITH THE LATEST ELECTRIC IGNITION SYSTEM. REPORT 1. THE ANALYSIS OF GAS UNDER NO LOAD.
*17353 APTIC NO. 35807

SATO T
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM
17106 APTIC NO. 35965

STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL203.
17294 APTIC NO. 36007

DETERMINATION OF MOLYBDENUM AND COBALT IN HYDRODESULFURIZATION CATALYSTS BY X-RAY FLUORESCENCE SPECTROMETRY.
*17354 APTIC NO. 36013

SATOMI Y
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923

STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

SATORI H
CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.
17301 APTIC NO. 35920

SAUNDERS V R
A THEORETICAL INTERPRETATION OF THE BONDING, AND THE PHOTOELECTRON AND ULTRA-VIOLET SPECTRA OF SULPHUR DIOXIDE.
17680 APTIC NO. 35079

SAWICKI E
TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD).
*17515 APTIC NO. 35727

SCARGILL D
DISSOCIATION CONSTANTS OF ANHYDROUS AMMONIUM SULPHATE AND AMMONIUM PYROSULPHITE PREPARED BY GAS-PHASE REACTIONS.
*17355 APTIC NO. 35849

SCARINGELLI R P
TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS)
17426 APTIC NO. 35728

SCHAEDLER W
A METHOD OF OPERATION OF A HALOGEN DETECTION DIODE AND APPARATUS
*17516 APTIC NO. 35509

SCHAEFER V J
AIR QUALITY OF AMERICAN HOMES.
*17566 APTIC NO. 35941

SCHANZ J J JR
THE ACTIVATED CARBON INDUSTRY.
*17356 APTIC NO. 35645

SCHEICH G
DETERMINATION OF THE ACID CONTENT OF AEROSOL PARTICLES.
17554 APTIC NO. 35545

SCHEPERS G W H
LUNG TUMORS OF PRIMATES AND RODENTS. PART II. INHALATION EXPERIMENTS.
*17764 APTIC NO. 35279

SCHERER K H
METHOD AND INSTRUMENT FOR THE MEASUREMENT OF TRACES OF GASES AND OF VAPORS IN A GASEOUS MEDIUM.
17477 APTIC NO. 35363

SCHILLER R A
MODERN METHODS OF REFUSE DISPOSAL IN A CHEMICAL WORKS.
*17130 APTIC NO. 35305

SCHLEGEL K
PHOTOIONIZATION YIELDS OF 0, 02 AND N2 FOR HIGH AND LOW SOLAR ACTIVITY.
*17647 APTIC NO. 36000

SCHLEICHER A R
FUNDAMENTAL AIR POLLUTION CONSIDERATIONS FOR URBAN AND TRANSPORTATION PLANNERS.
17872 APTIC NO. 35850

SCHLESINGER M D
THE REGENERATION OF ALKALIZED ALUMINA.
*17357 APTIC NO. 35537

SCHLOSSER D W
PHOTOFRAGMENT SPECTROMETER.
17447 APTIC NO. 35179

SCHMID E
METHOD AND EQUIPMENT FOR THE ADSORPTION OF AT LEAST ONE GASEOUS COMPONENT FROM A GAS MIXTURE.
*17358 APTIC NO. 35952

SCHMIDT K R
CONTINUOUS MONITORING OF SULFUR TRIOXIDE (SULFOTHERM II).
17518 APTIC NO. 35332

SCHNEEBERGER R F
AEROSOL SAMPLING FOR PARTICLE SIZE ANALYSIS (FINAL COMPREHENSIVE REPORT)
*17517 APTIC NO. 35424

SCHOENBERGER R J
REGIONAL AIR QUALITY CONTROL - THE IMPACT AND COSTS OF REFUSE INCINERATION
*17833 APTIC NO. 35215

SCHOTT M
CONTINUOUS MONITORING OF SULFUR TRIOXIDE (SULFOTHERM II).
*17518 APTIC NO. 35332

SCHROEDER H A
METALS IN THE AIR.
17765 APTIC NO. 35055

SCHULTE H F
LOS ALAMOS ENVIRONMENTAL MONITORING PROGRAM JULY THROUGH DECEMBER 1970
17556 APTIC NO. 35407

SCHULTZ M A
INVESTIGATION OF A DEVICE USING RADIATION TO CHARGE AND COLLECT PARTICULATE MATTER
17222 APTIC NO. 36015

SCHULZE F
STATIC NITROGEN DIOXIDE MONITOR
*17519 APTIC NO. 35256

SCHWAN R
NOVEL FILTER MEDIUM FOR DRY DUST COLLECTION
*17359 APTIC NO. 35889

SCHWEIGART H A
HUMAN ECOLOGICAL ASPECTS OF THE ENVIRONMENT AND ENVIRONMENTAL RESEARCH
*17904 APTIC NO. 35867

SCHWESINGER G
INVESTIGATION ABOUT THE EFFECTS OF A SINGLE INTRATRACHEAL APPLICATION OF APATITE-NEPHELINE AND APATITE-CONCENTRATE DUST TO RAT LUNGS
17743 APTIC NO. 35973

SCORER R S
NEW ATTITUDES TO AIR POLLUTION - THE TECHNICAL BASIS OF CONTROL.
*17891 APTIC NO. 35892

SCOTT W E
THE COMPOSITION AND ODOR OF DIESEL EXHAUST
17128 APTIC NO. 35635

SEBA D B
PESTICIDES IN THE LOWER ATMOSPHERE OF THE NORTHERN EQUATORIAL ATLANTIC OCEAN
*17567 APTIC NO. 36020

SEDUNOV YU S
ON THE DEPENDENCE OF MAXIMUM SUPERSATURATIONS AND THE CONCENTRATION OF DROPLETS FORMED IN

A RISING AIR CURRENT ON THE SPECTRUM OF CLOUD NUCLEI
17622 APTIC NO 35562

SEEBER L
TENNESSEE VALLEY AUTHORITY ENVIRONMENTAL QUALITY MANAGEMENT. POLICY, DELEGATIONS, RESERVATIONS, AND PROCEDURES
*17892 APTIC NO 35806

SEHMEL G A
THE DEPOSITION OF AEROSOLS BY TURBULENT FLOW PROCESSES WITHIN VERTICAL TUBES.
*17692 APTIC NO 35634

SEIDL W
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA REPORT I ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
*17893 APTIC NO 35275

SEIM E C
SULFUR DIOXIDE ABSORPTION BY SOIL.
*17360 APTIC NO 35836

SEINFELD J H
DEVELOPMENT AND VALIDATION OF A GENERALIZED MECHANISM FOR PHOTOCHEMICAL SMOG
17611 APTIC NO 35853

SEKI M
STACK GAS DESULFURIZATION BY ADSORPTION.
*17361 APTIC NO 35790

SEKINE T
DETERMINATION OF MOLYBDENUM AND COBALT IN HYDRODESULFURIZATION CATALYSIS BY X-RAY FLUORESCENCE SPECTROMETRY
17354 APTIC NO 36013

SELTZER W
A METHOD FOR THE TREATMENT OF ANIMAL WASTES TO CONTROL AMMONIA AND OTHER ODORS
*17131 APTIC NO. 35673

SEM J
PIEZOELECTRIC MICROBALANCE FOR MONITORING THE MASS CONCENTRATION OF SUSPENDED PARTICLES.
ERROR

SENKEVICH E V
CALCULATION OF A GAS COMBUSTION PROCESS USING EXHAUST AIR CONTAINING COMBUSTIBLE COMPONENTS.
*17362 APTIC NO. 35771

SENOO M
CHOICE OF ACTIVABLE TRACER FOR SPRAYING ARGICULTURAL INSECTICIDES BY HELICOPTER.
17434 APTIC NO. 35621

SERBINA L P
SEPARATE DETERMINATION OF NITROGEN OXIDES IN THE ATMOSPHERE.
17458 APTIC NO. 35129

SERGEY D
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION
17572 APTIC NO 35366

SHAIR F H
NITRIC OXIDE EMISSION STUDIES OF INTERNAL COMBUSTION ENGINES
*17132 APTIC NO 35852

SHANNON L J
PARTICULATE POLLUTANT SYSTEM STUDY VOLUME II HANDBOOK OF EMISSION PROPERTIES
17146 APTIC NO 35574

SHAPUNOV L A
A SPECTROCHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF MICROCONTAMINANTS IN GASES
*17520 APTIC NO 35327

SHEFFER W M
I-C ENGINE EXHAUST GAS AFTERBURNER AIR CONTROL
17248 APTIC NO 35800

SHELEF M
THE BEHAVIOR OF NITRIC OXIDE IN HETEROGENEOUS CATALYTIC REACTIONS
*17693 APTIC NO 35311

SHEPHARD R J
ATMOSPHERIC POLLUTION AND CHRONIC CHEST DISEASE
*17766 APTIC NO 35741

SHEVCHENKO V D
STUDIES ON THE REGENERATION OF UNWOVEN FILTER FABRICS
17299 APTIC NO 35758

SHIDARA M
TREND OF DESULFURIZATION TECHNIQUES ON STACK GASES.
*17363 APTIC NO 35744

SHIEH W
EXPERIMENTAL BEHAVIOR OF WASTE COMBUSTION IN A TEST INCINERATOR.
*17364 APTIC NO. 35566

SHIGETA A
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE. AS CONCLUSION FROM 1965 TO 1971.
17557 APTIC NO. 35116

SHIGETA Y
METHODS OF MEASURING BAD ODOR AND CONTROL TECHNIQUE.
*17521 APTIC NO. 35751

SHIMIZU Y
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

SHIMOI Y
INCINERATION OF RHODANIDE SALT.
17255 APTIC NO. 35048

SHIMOTAKE H
LITHIUM/SULFUR CELLS AND THEIR POTENTIAL FOR VEHICLE PROPULSION.
*17133 APTIC NO. 35539

SHINODA K
ANALYSIS AND EXPERIMENTS ON CARBURETOR METERING AT THE TRANSITION REGION TO THE MAIN SYSTEM.
*17134 APTIC NO. 35614

SHINRA K
DETERMINATION OF CARBON MONOXIDE IN THE ATMOSPHERE.
17467 APTIC NO. 35157

SHIONO T
DETERMINATION OF CARBON MONOXIDE IN THE ATMOSPHERE.
17467 APTIC NO. 35157

SHIOZAWA K
A STUDY ON THE RELATION BETWEEN AIR POLLUTANTS CONCENTRATION AND AIR PRESSURE DISTRIBUTIONS.
*17648 APTIC NO. 35991

SHISHKOV D
APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS IN STUDYING THE REGENERATION PROCESS OF A LOW-TEMPERATURE CATALYST UTILIZED FOR THE CONVERSION OF CARBON MONOXIDE.
*17365 APTIC NO. 35755

SHLYAPNIKOV V A
PURIFICATION OF GASES FROM ELECTROCHEMICAL PRODUCTION OF CHLORATES.
*17366 APTIC NO. 35330

SHOJI H
PROBLEMS IN POLLUTION CONTROL PROGRAMS: A SYMPOSIUM.
*17894 APTIC NO. 35921

SHRAIBMAN S S
PURIFICATION OF GASES FROM ELECTROCHEMICAL PRODUCTION OF CHLORATES.
17366 APTIC NO. 35330

SHRINER W
AIR POLLUTION REDUCTION SYSTEM.
*17367 APTIC NO. 35720

SHWARTZ J
HYDRODYNAMIC ASPECTS OF WASTE DISCHARGE.
17657 APTIC NO. 35934

SIDEBOTTOM H W
PHOTOOXIDATION OF SULFUR DIOXIDE.
*17649 APTIC NO. 35856

SIELE W I
A LABORATORY STUDY OF AN EXTRACTION SYNTHESIS TECHNIQUE FOR THE ELIMINATION OF POLLUTANTS FROM THE MAHON FOG FILTER WATERS AT TNT PLANTS.
*17135 APTIC NO. 35655

SIGAL I A
ESTIMATE OF THE INFLUENCE OF VARIOUS GAS EJECTION SOURCES ON POLLUTION IN THE ATMOSPHERE.
*17650 APTIC NO. 35565

SIGG C
PROCESS AND DEVICE FOR THE COOLING OR CONDITIONING OF GASES.
*17368 APTIC NO. 35528

SIGSBY J E
TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD).
17515 APTIC NO. 35727

SIGWORTH H JR
THE 1970 CLEAN AIR CAR RACE AND THE UNIVERSITY OF WISCONSIN ENTRIES.
17125 APTIC NO. 35484

SILVERMAN L
COLLECTION OF FLUORIDE FUMES IN AIR.
17531 APTIC NO. 35173
AIR CLEANING STUDIES PROGRESS REPORT FOR FEBRUARY 1, 1951 TO JUNE 30, 1952.
17229 APTIC NO. 35180
REMOVAL OF SOLUBLE GASES AND PARTICULATES FROM AIR STREAMS WITH SPECIAL REFERENCE TO FLUORIDES.
17196 APTIC NO. 35448

SIMKINA S L
PHOTOELECTRIC GAS ANALYZERS.
17487 APTIC NO. 35605

SIMMONS R L
TRANSFER OF IRON FROM SERUM IRON-BINDING PROTEIN TO HUMAN RETICULOCYTES.
17745 APTIC NO. 35233

SIMPSON P
IMPROVEMENTS IN OR RELATING TO HYDROGEN SULPHIDE REMOVAL FROM GASES.
17262 APTIC NO. 35189

SITMAN W D
ENVIRONMENTAL ASPECTS OF SITE SELECTION FOR A PETROLEUM REFINERY.
17062 APTIC NO. 35887

SIVAK G I
UTILIZATION OF SULFUR DIOXIDE FROM INDUSTRIAL WASTES.
17265 APTIC NO. 35133

SIVASANKARA PILLAY K K
DETERMINATION OF MERCURY IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES BY NEUTRON ACTIVATION ANALYSIS.
*17522 APTIC NO. 35083

SKALA H
POLYNUCLEAR AROMATICS IN AUTOMOBILE EXHAUST.
17124 APTIC NO. 35818

SLACK A V
SO2: MORE QUESTIONS THAN ANSWERS.
*17369 APTIC NO. 35056

SLEIK H
DETERMINATION OF GASEOUS AIR POLLUTION BY CARBON ADSORPTION.
17528 APTIC NO. 35598

SLIGER A G
REMOVAL OF SO2 FROM POWER PLANT FLUE GASES USING THE ALKALIZED ALUMINA PROCESS. (FINAL REPORT).
17224 APTIC NO. 35505

SLOAN D A
FILTERING APPARATUS FOR THE FILTRATION OF GAS CONTAINING PARTICULATE MATTER ESPECIALLY OF AIR CONTAINING PARTICULATE POLLUTANTS.
17288 APTIC NO. 35140

SMIKA D E
DUST IN THE AIR FROM SOIL.
*17136 APTIC NO. 35555

SMITH D J
APPLICATIONS OF A HIGH-VOLTAGE TRANSMISSION SCANNING ELECTRON MICROSCOPE.
17456 APTIC NO. 35457

SMITH H
TRACE ELEMENTS IN THE LUNG.
17755 APTIC NO. 35453

SMITH J L
ENVIRONMENTAL DATA BASE FOR REGIONAL STUDIES IN THE HUMID TROPICS. (FINAL REPORT).
17545 APTIC NO. 35392

SMITH L P
FREQUENCIES OF POOR AFTERNOON VISIBILITIES IN ENGLAND AND WALES.
*17651 APTIC NO. 35245

SMITH P W
FILTER AND FILTER ASSEMBLY.
*17370 APTIC NO. 35742

SMITH R D
THE CPU-400 GAS TURBINE INCINERATOR DEVELOPMENT.
*17137 APTIC NO. 35434

SMITH R J JR
SOME EFFECTS OF EXHAUST GAS RECIRCULATION UPON AUTOMOTIVE ENGINE INTAKE SYSTEM DEPOSITS AND CRANKCASE LUBRICANT PERFORMANCE.
17237 APTIC NO. 35689

SMITH R P
COBALT LYSIS AND METHEMOGLOBIN ACCUMULATION IN HUMAN ERYTHROCYTE SUSPENSIONS.
*17767 APTIC NO. 35213

SMITH S
VOLATILIZATION OF SOIL-APPLIED DDT AND DDD FROM FLOODED AND NONFLOODED PLOTS.
17571 APTIC NO. 35082

SMITH W H
OZONE SUPPRESSION OF WHITE PINE NET PHOTOSYNTHESIS.
17790 APTIC NO. 35287

SOBEL A T
CONTROL OF ODORS THROUGH MANURE MANAGEMENT.
17310 APTIC NO. 35879

SOBRINO R
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

SOHLMAN M
OUR POLLUTED AIR.
*17905 APTIC NO. 35273

SOKOLOWSKI A W
THE IMPACT OF AIR POLLUTIONS EMITTED BY THE NITROGEN PLANT AT PULAWY ON FOREST VEGETATION.
*17813 APTIC NO. 35770

SOKULSKII G P
DISCHARGES TO ATMOSPHERE FROM BENZOLE PLANT.
17558 APTIC NO. 35081

SOLOVIEV V I
THE STUDY OF VELOCITY FIELDS IN A VORTEX DUST COLLECTOR.
17392 APTIC NO. 35543

SOLOVIEVA T V
SEPARATE DETERMINATION OF NITROGEN OXIDES IN THE ATMOSPHERE.
17458 APTIC NO. 35129
THE PHYSICOCHEMICAL MECHANISM OF OZONE AND PHOTOOXIDANTS FORMATION IN THE ATMOSPHERE.
17600 APTIC NO. 35987

SOMMERVILLE R J
SENSITIVITY VERSUS TARGET BACKINGS FOR ELEMENTAL ANALYSIS BY ALPHA EXCITED X-RAY FLUORESCENCE.
17465 APTIC NO. 35591

SONDEL J A
DETERMINATION OF MERCURY IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES BY NEUTRON ACTIVATION ANALYSIS.
17522 APTIC NO. 35083

SOREM S S
EFFECTS OF FUEL FACTORS ON EMISSIONS.
*17371 APTIC NO 35688

SORENSON G W
ECONOMIC EFFECTS OF CHANGES IN AIR QUALITY. ANNUAL REPORT).
17834 APTIC NO. 35710

SOUZA A F
EXHAUST EMISSIONS OF LIGHT AIRCRAFT.
17152 APTIC NO. 35220

SPANGLER J
SEROLOGIC RESPONSE IN SQUIRREL MONKEYS EXPOSED TO NITROGEN DIOXIDE AND INFLUENZA VIRUS.
17730 APTIC NO. 35789

SPECTER M J
EPIDEMIOLOGY OF LEAD POISONING IN NEW YORK CITY - 1970.
*17768 APTIC NO. 35587

SPEDDEN H R
IMPACT OF ENVIRONMENTAL CONTROLS ON NONFERROUS METALS EXTRACTION.
*17372 APTIC NO. 35848

SPEIGHT F Y
STANDARDIZATION ASPECTS OF AIR POLLUTION CONTROL.
*17845 APTIC NO. 35646

SPENCER D L
AIR SAMPLING FOR PESTICIDES IN THE HUMAN ENVIRONMENT.
17570 APTIC NO. 35341

SPENGLER G
GAS ANALYZER.
17463 APTIC NO. 35514

SPLIETHOFF H
TAKEOFF FOR HOT DUSTY GASES.
*17523 APTIC NO. 35918

SPRINGSTON D P
AEROSOL SAMPLING FOR PARTICLE SIZE ANALYSIS. (FINAL COMPREHENSIVE REPORT).
17517 APTIC NO. 35424

SPRUNG J L
NITROGEN DIOXIDE CATALYZED CIS-TRANS ISOMERIZATION OF CIS-2 BUTENE.
*17694 APTIC NO. 36016

SRIVASTAVA G P
INTERESTING EVIDENCE OF STRATOSPHERIC DUST FROM ELECTRICAL CONDUCTIVITY MEASUREMENTS.
17561 APTIC NO. 35823

STAEGER H
TREATMENT OF DUST, SMOKE, AND AIR.
*17373 APTIC NO. 35625

STAIRMAND C J
THE CHEMICAL ENGINEERS CONTRIBUTION TO AIR POLLUTION CONTROL.
*17895 APTIC NO. 35900

STARA J F
SWIMMING AS A LABORATORY METHOD FOR EXERCISING DOGS.
17670 APTIC NO. 35683

STARK CH
VITAL CAPACITY AND FORCED INSPIRATION TEST IN SCHOOL CHILDREN OF THE FOURTH AND FIFTH GRADE FROM AREAS WITH DIFFERENT AIR HYGIENE CONDITIONS.
17739 APTIC NO. 35968

STARR C
ENERGY AND POWER.
*17138 APTIC NO. 35864

STAUFFER R F
AIR QUALITY STANDARDS - PROCEDURAL PROBLEMS.
*17896 APTIC NO. 35697

STEBBINGS J H JR
CHRONIC RESPIRATORY DISEASE AMONG NONSMOKERS IN HAGERSTOWN, MARYLAND. IV. EFFECTS OF URBAN RESIDENCE ON PULMONARY FUNCTION VALUES.
*17769 APTIC NO. 35483

STEER R P
CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES.
17488 APTIC NO. 35091
CHEMILUMINESCENT REACTIONS OF OZONE WITH OLEFINS AND SULFIDES.
17489 APTIC NO. 35491

STEPHENS R E
THE EFFECTS OF AUTOMOBILE EXHAUST PARTICULATES ON VISIBILITY.
17655 APTIC NO. 35264

STERN G R
A WATER-COOLED SMOKE METER FOR THE ESTIMATION OF SOOT CONCENTRATIONS IN NATURAL GAS FLAMES.
17496 APTIC NO. 35723

STETTENBENZ L M
BENEFITS OF THE POWER-RECOVERY GAS EXPANDER.
*17374 APTIC NO. 35882

STEVENS R K
FIELD EVALUATION OF SULFUR DIOXIDE MONITORING INSTRUMENTS.
*17524 APTIC NO. 35191

STOCKHAM J
COOLING TOWER STUDY. (FINAL REPORT).
*17652 APTIC NO. 35419

STOCKS P
ENDEMIOLOGY OF CANCER OF THE LUNG IN ENGLAND AND WALES.
*17770 APTIC NO. 35469
LUNG CANCER DEATH RATES AMONG NON-SMOKERS AND PIPE AND CIGARETTE SMOKERS. AN EVALUATION IN RELATION TO AIR POLLUTION BY BENZPYRENE AND OTHER SUBSTANCES.
*17771 APTIC NO. 35603

STOEFEN D
POLLUTION OF THE ATMOSPHERE WITH LEAD AND ITS EFFECT ON PUBLIC HEALTH.
*17772 APTIC NO. 35704

STOFFT E
CONTENT IN FORMALDEHYDE OF THE AIR IN DISSECTING ROOMS.
*17568 APTIC NO. 35860

STONE C A
DETECTION OF AIR-BORNE BERYLLIUM DUST. (FINAL REPORT).
17469 APTIC NO. 35161

STOTZ W
GAS FILTER ARRANGEMENT.
17335 APTIC NO. 35148

STRAFUSS A C
STUDIES WITH CALCIUM ETHYLENEDIAMINETETRAACETATE IN CALVES: TOXICITY AND USE IN BOVINE LEAD POISONING.
17786 APTIC NO. 35209

STRAUSS W
THE APPLICATION OF VORTEX THEORY TO THE DESIGN OF CYCLONE COLLECTORS.
17383 APTIC NO. 35070
THE DEVELOPMENT OF A CONDENSER FOR ODOR CONTROL FROM DRY RENDERING PLANTS.
*17375 APTIC NO. 35647

STUECKRAD J
SOLID WASTE, WATER, AIR: WHAT ARE WE GOING TO BE CONFRONTED WITH? (Abfall, Wasser, Luft: Was kommt auf uns zu?). Text in German. Umwelt (Duesseldorf), no. 5:35-42, Oct./Nov. 1971. 6 refs.
*17139 APTIC NO. 35276
METHOD AND APPARATUS FOR INDUCTIVELY CHARGING A FILTER OF COMBINED METAL AND DIELECTRIC MATERIAL FOR COLLECTING NORMALLY CHARGED AIRBORNE PARTICLES.
*17376 APTIC NO. 35336

SUFRIN M
TO SCREEN OR NOT TO SCREEN FOR COPD.
*17773 APTIC NO. 35176

SUGIMAE A
TRACE METALS IN AIR BORNE PARTICULATES. I. SURVEY OF LEAD IN THE ATMOSPHERE.
17550 APTIC NO. 36009

SUGIMOTO S
SURVEY AND STUDY OF VARIOUS RESPIRATORY DISEASES WHICH WERE EXAMINED BY THE MEMBERS OF THE YOKKAICHI MEDICAL ASSOCIATION AND WERE THOUGHT TO HAVE BEEN INFLUENCED BY AIR POLLUTION.
17753 APTIC NO. 35074

SUGIURA G
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

SUMMERS C M
THE CONVERSION OF ENERGY.
*17140 APTIC NO. 35845

SUPATASHVILI G D
ON THE OCCURRENCE OF SOME HEAVY METALS IN ATMOSPHERIC PRECIPITATIONS ON THE TERRITORY OF GEORGIAN SOVIET REPUBLIC.
*17653 APTIC NO. 35669

SUSSEX G A
APPLICATIONS OF A HIGH-VOLTAGE TRANSMISSION SCANNING ELECTRON MICROSCOPE.
17456 APTIC NO. 35457

SUZUKI G
MANUFACTURING METHOD OF HIGHLY ACTIVE PALLADIUM-CARBON CATALYST.
*17377 APTIC NO. 35047

SUZUKI K
DATA AND EXAMINATION FOR ESTABLISHING SULFUR OXIDES EMISSION STANDARD.
*17846 APTIC NO. 35146

SUZUKI S
MANUFACTURING METHOD OF HIGHLY ACTIVE PALLADIUM-CARBON CATALYST.
17377 APTIC NO. 35047

SUZUKI T
PROBLEMS IN POLLUTION CONTROL PROGRAMS: A SYMPOSIUM.
17994 APTIC NO. 35921

SUZUKI Y
RELATION BETWEEN VISIBILITY AND AIR POLLUTION, ESPECIALLY FLOATING DUST, AT TOKYO INTERNATIONAL AIRPORT.
*17569 APTIC NO. 36014

SYROTA J
THE INDUSTRY AND THE ENVIRONMENT.
*17897 APTIC NO. 35943

SZCZENIOWSKI B
THE PROBLEM OF LEADED GASOLINE.
*17378 APTIC NO. 35535

T

TABACZYNSKI R J
TIME-RESOLVED MEASUREMENTS OF HYDROCARBON MASS FLOW RATE IN THE EXHAUST OF A SPARK-IGNITION ENGINE.
*17141 APTIC NO. 35580

TABUCHI K
CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.
17301 APTIC NO. 35920

TADA K
THE EXHAUST GAS ANALYSIS OF THE AUTOMOTIVE ENGINE EQUIPPED WITH THE LATEST ELECTRIC IGNITION SYSTEM. REPORT I. THE ANALYSIS OF GAS UNDER NO LOAD.
17 353 APTIC NO. 35807

TADA O
METAL FINISHING INDUSTRY AND ENVIRONMENTAL HEALTH.
*17142 APTIC NO. 35957

TAKAHASHI S
EXHAUST GAS CLEANING DEVICE FOR INTERNAL COMBUSTION ENGINES.
*17379 APTIC NO. 35289
PROBLEMS IN PUBLIC NUISANCE CONTROL PLANS.
*17380 APTIC NO. 35719

TAKAYAMA N
HYDRODESULFURIZATION IN KHAFJI RESIDUE OIL.
17300 APTIC NO. 35085
CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.
17301 APTIC NO. 35920

TAKAYAMA T
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

TAKAYAMA Y
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

TAKEMURA Y
HYDRODESULFURIZATION OF RESIDUAL OIL -- LONG RUN TEST.
17293 APTIC NO. 36004

TAKEUCHI T
NEUTRON ACTIVATION ANALYSIS OF AIRBORNE DUST.
17560 APTIC NO. 35828

TAKEZAWA N
REACTIONS OF GASEOUS POLLUTANTS WITH SOLIDS. I. INFRARED STUDY OF THE SORPTION OF SO2 ON CAO.
17309 APTIC NO. 35762

TAMADA H
MANAGEMENT OF PATIENTS RECOGNIZED BY THE ENVIRONMENTAL POLLUTION RELIEF LAW DISEASE OF YOKKAICHI CITY ASSOCIATED WITH AIR POLLUTION.
17774 APTIC NO. 35109

TAMURA Z
SULPHUR DIOXIDE EXTRACTION BY CHARCOAL ABSORPTION.
*17381 APTIC NO. 35298

TANAKA I
STACK GAS DESULFURIZATION BY ACTIVATED CARBON. (GAS SEPARATION METHOD).
17312 APTIC NO. 35997

TANAKA K
HYGIENIC CHEMICAL STUDIES ON PUBLIC HAZARDS BY HARMFUL SUBSTANCES. IV. ATOMIC ABSORPTION PHOTOMETRIC DETERMINATION OF LEAD IN GASOLINE.
*17143 APTIC NO. 36006

TATE K
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 4) -- IMPROVEMENT OF CATALYST SUPPORT.
17272 APTIC NO. 35923
STUDY ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL FUEL (PART 5) -- DEPOSITS ON THE USED CATALYST.
17273 APTIC NO. 35924

TATEISHI Y
MANAGEMENT OF PATIENTS RECOGNIZED BY THE ENVIRONMENTAL POLLUTION RELIEF LAW DISEASE OF YOKKAICHI CITY ASSOCIATED WITH AIR POLLUTION.
*17774 APTIC NO. 35109

TAYLOR D H
RECOMMENDATIONS FOR DUST COLLECTION SYSTEMS.
*17382 APTIC NO. 35087

TEBBENS B D
FATE OF ARENES INCORPORATED WITH AIRBORNE SOOT.
*17654 APTIC NO. 35604

TEMPLE P J
DOSE-RESPONSE OF URBAN TREES TO SULFUR DIOXIDE.
*17814 APTIC NO. 35262

TER HAAR G L
THE EFFECTS OF AUTOMOBILE EXHAUST PARTICULATES ON VISIBILITY.
*17655 APTIC NO. 35264

TERASHIMA S
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

TERRIERE L C
LOSSES OF ORGANOPHOSPHORUS INSECTICIDES DURING APPLICATION TO THE SOIL.
17099 APTIC NO. 35089

TERRILL J G JR
LIMITATIONS AND NEEDS FOR NUCLEAR TECHNIQUES IN ENVIRONMENTAL CONTROL.
*17525 APTIC NO. 35825

TERRY S L
A METHOD FOR SAMPLING AND ANALYZING TRONA DUST.
17482 APTIC NO. 35205

TESSARI J D
AIR SAMPLING FOR PESTICIDES IN THE HUMAN ENVIRONMENT.
*17570 APTIC NO. 35341

TEUNISSEN H W
CHARACTERISTICS OF THE MEAN WIND AND TURBULENCE IN THE PLANETARY BOUNDARY LAYER.
*17656 APTIC NO. 35365

THIES A C
ELECTRIC POWER AND THE ENVIRONMENT.
*17144 APTIC NO. 35692

THOMAS C CJR
DETERMINATION OF MERCURY IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES BY NEUTRON ACTIVATION ANALYSIS.
17522 APTIC NO. 35083

THOMAS J F
FATE OF ARENES INCORPORATED WITH AIRBORNE SOOT.
17654 APTIC NO. 35604

THOMASON I D
GENERATION OF A SODIUM CHLORIDE AEROSOL FOR IN-PLACE TESTING OF AIR FILTERS.
17444 APTIC NO. 35876

THOMPSON B W
THE APPLICATION OF VORTEX THEORY TO THE DESIGN OF CYCLONE COLLECTORS.
*17383 APTIC NO. 35070

THOMPSON D
THE FORMATION OF OXIDES OF NITROGEN IN A COMBUSTION SYSTEM.
*17145 APTIC NO. 35228

THORP J M
FIELD INVESTIGATION OF SULFUR DIOXIDE WASHOUT FROM THE PLUME OF A LARGE COAL-FIRED POWER PLANT BY NATURAL PRECIPITATION. (FINAL REPORT).
17607 APTIC NO. 35573

TIKHONOV N V
REDUCING AIR POLLUTION FROM MINING EXPLORATION WITH DIESEL ENGINES.
*17384 APTIC NO. 35756

TINGEY D T
VEGETATION INJURY FROM THE INTERACTION OF NITROGEN DIOXIDE AND SULFUR DIOXIDE.
*17815 APTIC NO. 35192

EFFECT OF LOW CONCENTRATIONS OF OZONE AND SULFUR DIOXIDE ON FOLIAGE, GROWTH AND YIELD OF RADISH.
*17816 APTIC NO. 35929

TOBA T
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

TOCHIGI R
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

TODO N
STUDIES ON HYDRODESULFURIZATION CATALYST OF RESIDUAL-OIL. I. THE PREPARATION METHODS AND THEIR EFFECTS ON THE ACTIVITIES OF MO-CO-AL203.
17294 APTIC NO. 36007

AN ESR STUDY OF AN AL203-M003-C00 CATALYST IN A SYSTEM WITH H2 AND THIO-BETA-NAPHTHOL.
17390 APTIC NO. 36008

DETERMINATION OF MOLYBDENUM AND COBALT IN HYDRODESULFURIZATION CATALYSTS BY X-RAY FLUORESCENCE SPECTROMETRY.
17354 APTIC NO. 36013

TOKIWA Y
STATUS OF MEASURING AIR QUALITY.
*17526 APTIC NO. 35984

TOLKACZ V
SEROLOGIC RESPONSE IN SQUIRREL MONKEYS EXPOSED TO NITROGEN DIOXIDE AND INFLUENZA VIRUS.
17730 APTIC NO. 35789

TOMINAGA H
CHOICE OF ACTIVABLE TRACER FOR SPRAYING ARGICULTURAL INSECTICIDES BY HELICOPTER.
17434 APTIC NO. 35621

TORII I
ON AIR POLLUTION IN SOUTH PART OF OKAYAMA PREFECTURE. AS CONCLUSION FROM 1965 TO 1971.
17557 APTIC NO. 35116

TORII K
AUTOMATED CHEMICAL ANALYSIS OF AIR AND WATER POLLUTION.
*17527 APTIC NO. 36002

TORRES R
RISK FACTORS AND PREVALENCE OF CORONARY HEART DISEASE IN PUERTO RICO.
17735 APTIC NO. 35164

TRAUFFER W E
KENTUCKY STONE CO. S NEW DUSTLESS STONE PLANT.
*17385 APTIC NO. 35893

TREICHLER R
A STUDY OF ABSORPTION AND RETENTION OF LEAD IN WILD WATERFOWL IN RELATION TO CLINICAL EVIDENCE OF LEAD POISONING.
17792 APTIC NO. 35397

TRINDADE H A
SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

TRUHAUT R
PRESENT CONDITION OF THE PROBLEM OF PERMISSIBLE OR TOLERABLE LIMITS FOR POTENTIALLY TOXIC CHEMICALS IN OCCUPATIONAL ENVIRONMENT.
*17775 APTIC NO. 35979

TRUITT J
THE FUNCTION OF CONDENSING STEAM IN AEROSOL SCRUBBERS.
*17386 APTIC NO. 35304

TRUMBULL T
GOVERNMENT APPROACHES TO AIR POLLUTION CONTROL. A COMPENDIUM AND ANNOTATED BIBLIOGRAPHY.
17898 APTIC NO. 35364

TSAREV V V
REDUCING AIR POLLUTION FROM MINING EXPLORATION WITH DIESEL ENGINES.
17384 APTIC NO. 35756

TSCHUDY D P
THE DETERMINATION OF AMINOKETONES IN BIOLOGICAL FLUIDS.
17752 APTIC NO. 35620

TSESSARSKII V N
OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING.
17180 APTIC NO. 35478

TSUKAHARA M
STUDY ON COMBUSTION GAS FROM A PREDETERMINED AMOUNT OF COMBUSTION (I), EFFECT OF THE WALL TEMPERATURE AND THE PRESSURE OF AIR-FUEL MIXTURE ON FORMATION OF EXHAUST GAS.
*17387 APTIC NO. 35839

TSUSHIMA Y
FIRST JAPANESE-MADE SULFUR DIOXIDE RECOVERY PLANT OF THE WELLMAN- LORD PROCESS.
*17388 APTIC NO. 35054

TULIN M P
HYDRODYNAMIC ASPECTS OF WASTE DISCHARGE.
*17657 APTIC NO. 35934

TUMASONIS C F
MODIFIED ROLLER DRUM APPARATUS FOR ANALYZING EFFECTS OF POLLUTANT GASES ON TISSUE CULTURE SYSTEMS.
17706 APTIC NO. 35522

TURK A
DETERMINATION OF GASEOUS AIR POLLUTION BY CARBON ADSORPTION.
*17528 APTIC NO. 35598

U

UCHIDA H
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

UCHIDA S
UNLEADED GASOLINE PROBLEMS.
*17389 APTIC NO. 35080

UCHIGASAKI K
ABSORPTION OF SULFUR DIOXIDE IN N, N-DIMETHYLANILINE WITH CORONA DISCHARGE.
17667 APTIC NO. 35046

UEDA H
AN ESR STUDY OF AN AL203-M003-C00 CATALYST IN A SYSTEM WITH H2 AND THIO-BETA-NAPHTHOL.
*17390 APTIC NO. 36008

UEHARA S
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

UNDERHILL D W
SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

UOZUMI S
CONTROL OF CARBON GASES IN CENTRAL AIR CONDITIONING.
*17391 APTIC NO. 35785

UPHAM J B
EFFECT OF ATMOSPHERIC POLLUTANTS ON CORROSION BEHAVIOR OF STEELS.
17821 APTIC NO. 35402

URONE P
TENTATIVE METHOD OF ANALYSIS OF THE SULFATION RATE OF THE ATMOSPHERE (LEAD DIOXIDE PLATE METHOD-TURBIDIMETRIC ANALYSIS).
17426 APTIC NO. 35728

USPENSKY V A
THE STUDY OF VELOCITY FIELDS IN A VORTEX DUST COLLECTOR
*17392 APTIC NO. 35543

UYEHARA O A
THE ABCS OF ENGINE EXHAUST EMISSIONS.
17328 APTIC NO. 35049
THE 1970 CLEAN AIR CAR RACE AND THE UNIVERSITY OF WISCONSIN ENTRIES.
17125 APTIC NO. 35484

UZUNOV N
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

V

VACHEV D
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
17572 APTIC NO. 35386

VAKHLAMOV S V
COMPUTATION OF THE TRAJECTORY OF A JET IN A DRIFTING FLOW.
*17695 APTIC NO. 35212

VALITOV N KH
UTILIZATION OF SULFUR DIOXIDE FROM INDUSTRIAL WASTES.
17265 APTIC NO. 35133

VAN DER WAL J F
COMPARATIVE MEASUREMENTS OF AIR POLLUTANTS IN THE IRON AND STEEL INDUSTRY OF FIVE MEMBER-COUNTRIES OF THE EUROPEAN COAL AND STEEL COMMUNITY.
17501 APTIC NO. 35951

VANDEGRIFT A E
PARTICULATE POLLUTANT SYSTEM STUDY. VOLUME II - HANDBOOK OF EMISSION PROPERTIES.
*17146 APTIC NO. 35574

VANDEPOELE A R
THE PHYSICIAN AND AIR POLLUTION: II.
*17776 APTIC NO. 35064

VARDI J
APPLICATION OF CATALYSTS TO AUTOMOTIVE NOX EMISSIONS CONTROL.
17197 APTIC NO. 35223

VARS R C
ECONOMIC EFFECTS OF CHANGES IN AIR QUALITY. ANNUAL REPORT).
*17834 APTIC NO. 35710

VARS R C JR
AN ASSESSMENT OF SMOKE MANAGEMENT.
*17658 APTIC NO. 35172

VARTANIAN E S
MEASUREMENT OF THE AVERAGE STRUCTURAL CHARACTERISTIC OF THE ATMOSPHERIC REFRACTIVE INDEX
17619 APTIC NO. 35700

VEIRS V R
AIR QUALITY OF AMERICAN HOMES.
17566 APTIC NO. 35941

VEKRIS S L
DISPERSION OF COAL PARTICLES FROM STORAGE PILES.
*17659 APTIC NO. 36027

VELTE R G
NEW DEVELOPMENTS IN DUST COLLECTING EQUIPMENT FOR ELECTRIC UTILITIES. TI-5 PUBLIC UTILITIES COMMITTEE SURVEY REPORT NO. 1.
17191 APTIC NO. 35286

VENKATARAMAN K
SELECTION AND ADAPTATION OF A PROCESS FOR SULPHUR DIOXIDE REMOVAL FROM STACK GASES IN CONTACT SULPHURIC ACID PLANTS.
17314 APTIC NO. 35881

VENTER G
DISCUSSIONS. A NUMERICAL EXPERIMENT IN SIMULATING THE TRANSPORT OF SULPHUR DIOXIDE THROUGH THE ATMOSPHERE.
17608 APTIC NO. 35749

VIESSMAN W
CAUSE AND CONTROL OF ODOR IN AIR CONDITIONED SPACES.
*17393 APTIC NO. 35650

VIGIL J S
CONCENTRIC ANNULAR VENTURI GAS SCRUBBER.
*17394 APTIC NO. 35716

VINCENT J H
EVALUATION OF A LIGHT TRANSMISSION TECHNIQUE FOR TESTING A TWO-STAGE ELECTROSTATIC DUST PRECIPITATOR.
*17395 APTIC NO. 35851

VISHNEVSKIY V L
REFLEX REACTIONS OF AN ORGANISM UNDER THE EFFECT OF HF, NAF AND ALF3.
17763 APTIC NO. 35670

VISNAPUU L YU
A DEVICE FOR AEROSOL PRODUCTION.
*17696 APTIC NO. 35412

VOLSKAYA A S
HYDROPHOBIC COATINGS PROVIDING INCREASED RELIABILITY FOR HIGH VOLTAGE INSULATION. HYDROPHOBIC PASTES OF THE ORGRES.
*17826 APTIC NO. 35773

VON VOROS G
TURBULENCE INDUCING ELECTROGASDYNAMIC PRECIPITATOR.
17241 APTIC NO. 35499

VOSKRESENSKIY N
SOME CHEMICAL AND COLLOIDAL PROPERTIES OF CURING SMOKE.
17686 APTIC NO. 35239

W

WACKERNAGEL R
METHOD FOR REMOVAL OF HYDROGEN SULFIDE FROM HYDROCARBON CONTAINING GASES.
*17396 APTIC NO. 35291

WAGNER T O
MOTOR GASOLINE AND AUTOMOTIVE AIR POLLUTION.
*17147 APTIC NO. 35050

WAKEHAM W A
REFERENCE VALUES OF THE VISCOSITY OF TWELVE GASES AT 25 C.
17685 APTIC NO. 35143

WALKER B
EXHAUST SYSTEM.
*17397 APTIC NO. 35297

WALKER J H
GAS AS AN ENGINE FUEL.
17067 APTIC NO. 35376

WALLACE F J
EXPERIMENTAL AND ANALYTICAL SCAVENGING STUDIES ON A TWO-CYCLE OPPOSED PISTON DIESEL ENGINE.
*17148 APTIC NO. 35475

WALLER R E
AIR POLLUTION AND RESPIRATORY INFECTION IN CHILDREN.
17726 APTIC NO. 35663

WANG I Y
ENZYMATIC CONVERSION OF BENZO(A)PYRENE HYDROXYLATION VS DNA Binding
*17777 APTIC NO. 35345

WARNICK A
AN OZONE-NO CHEMILUMINESCENCE METHOD FOR NO ANALYSIS IN PISTON AND TURBINE ENGINES.
17506 APTIC NO. 35607

WARREN R C
OVERHEAD VALVE ACTION AND AIR POLLUTANT DEVICE.
*17398 APTIC NO. 35738

WATANABE T
HYDRODESULFURIZATION IN KHAFJI RESIDUE OIL.
17300 APTIC NO. 35085
CATALYTIC HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.
17301 APTIC NO. 35920

WATSON D A
A FLUORESCENT SOURCE NDIR CARBON MONOXIDE ANALYZER.
17490 APTIC NO. 35167

WEATHERALL M
THE EFFECTS OF LEAD, MERCURY, AND GOLD ON THE POTASSIUM TURNOVER OF RABBIT BLOOD CELLS
17746 APTIC NO. 35218

WEAVER E E
EFFECTS OF NON-LEADED FUELS ON EXHAUST HYDROCARBON COMPOSITION AND CATALYST LIFE.
17073 APTIC NO. 35353

WEAVER J E
RELATIVE TRANSPIRATION OF CONIFEROUS AND BROAD-LEAVED TREES IN AUTUMN AND WINTER.
*17817 APTIC NO. 35229

WEBER K
PROCESS FOR THE MANUFACTURE OF SEPARATION NOZZLES AND THE SEPARATION NOZZLE MADE IN ACCORDANCE WITH THE PROCESS.
*17399 APTIC NO. 35325

WEIHING J L
EFFECTS OF AIR POLLUTION ON VEGETATION IN NEBRASKA.
17803 APTIC NO. 35394

WEINER J
AIR POLLUTION IN THE PULP AND PAPER INDUSTRY.
*17149 APTIC NO. 35581

WEISZ H
INVESTIGATIONS ON THE BENZO(A)PYRENE CONTENT OF HUMAN LUNGS.
*17778 APTIC NO. 35972

WEITZ H M
SEPARATION OF BROMINE FROM GASEOUS MIXTURES CONTAINING OXIDES OF NITROGEN.
17677 APTIC NO. 35299

WEST L B JR
FUNDAMENTAL AIR POLLUTION CONSIDERATIONS FOR URBAN AND TRANSPORTATION PLANNERS.
17872 APTIC NO. 35850

WETTEBORN W
A PROCESS FOR THE SEPARATION OF DROPLETS AND/OR OF FINE SOLID PARTICLES FROM A FLOW OF GAS.
*17400 APTIC NO. 35515

WHITE E W
PARTICLE SIZE DISTRIBUTIONS OF PARTICULATE ALUMINAS FROM COMPUTER-PROCESSED SEM IMAGES.
*17529 APTIC NO. 35571

WHITE L D
TENTATIVE METHOD FOR THE CONTINUOUS ANALYSIS OF TOTAL HYDROCARBONS IN THE ATMOSPHERE (FLAME IONIZATION METHOD).
17515 APTIC NO. 35727

WHITE W W
DETERMINATION OF MERCURY BY A COMBUSTION TECHNIQUE USING GOLD AS A COLLECTOR.
17431 APTIC NO. 35826

WHITFIELD J
GAS CHROMATOGRAPHIC STUDY OF AIR QUALITY IN SCHOOLS.
17460 APTIC NO. 35541

WIGG E E
APPLICATION OF CATALYSTS TO AUTOMOTIVE NOX EMISSIONS CONTROL.
17197 APTIC NO. 35223

WILKS P A JR
INFRARED ANALYSIS OF PROCESS EMISSIONS.
*17530 APTIC NO. 35306

WILLETT H P
REMOVAL OF OFF-GASES FROM OXYGEN STEEL CONVERTERS.
*17401 APTIC NO. 35314

WILLIAMS C R
COLLECTION OF FLUORIDE FUMES IN AIR.
*17531 APTIC NO. 35173

WILLIAMS G C
NITRIC OXIDE FORMATION IN PREMIXED AND DIFFUSION FLAMES.
*17150 APTIC NO. 35214

WILLIS G H
VOLATILIZATION OF SOIL-APPLIED DDT AND DDD FROM FLOODED AND NONFLOODED PLOTS.
*17571 APTIC NO. 35082

WILSON D A
THE KINEMATIC BEHAVIOR OF SPHERICAL PARTICLES IN AN ACCELERATING ENVIRONMENT.
*17660 APTIC NO. 35440

WILSON H
METHOD AND APPARATUS FOR THE MEASUREMENT OF THE SHARE OR PARTIAL PRESSURE OF A GAS MIXTURE COMPONENT.
*17697 APTIC NO. 35890

WILSON K R
PHOTOFRAGMENT SPECTROMETER.
17447 APTIC NO. 35179

WINCHESTER J W
TIME VARIATIONS OF LEAD, COPPER AND CADMIUM CONCENTRATIONS IN AEROSOLS IN ANN ARBOR, MICHIGAN.
17549 APTIC NO. 35489

WINEBRENER G L
DUEL BATTERY ELECTRIC POWERPLANT.
17085 APTIC NO. 35712

WINTRINGHAM J S
MEETING FUTURE EMISSION STANDARDS WITH LEADED FUELS.
17178 APTIC NO. 35778

WISMATH H
GAS ANALYZER.
17463 APTIC NO. 35514

WITHERSPOON R
GOVERNMENT APPROACHES TO AIR POLLUTION CONTROL. A COMPENDIUM AND ANNOTATED BIBLIOGRAPHY.
*17898 APTIC NO. 35364

WITHERSPOON R R
DUEL BATTERY ELECTRIC POWERPLANT.
17085 APTIC NO. 35712

WODKOWSKI C S
EFFECTS OF NON-LEADED FUELS ON EXHAUST HYDROCARBON COMPOSITION AND CATALYST LIFE.
17073 APTIC NO. 35353

WOERTGE F P
STACK ATTACHMENT.
*17402 APTIC NO. 35516

WOHLERS H C
REGIONAL AIR QUALITY CONTROL - THE IMPACT AND COSTS OF REFUSE INCINERATION.
17833 APTIC NO. 35215

WOHLLEBE H
MEASURING DEVICES FOR EXHAUST EMISSIONS BY DIESEL ENGINES.
*17532 APTIC NO. 35317

WOLF M A
FIELD INVESTIGATION OF SULFUR DIOXIDE WASHOUT FROM THE PLUME OF A LARGE COAL-FIRED POWER PLANT BY NATURAL PRECIPITATION. (FINAL REPORT).
17607 APTIC NO. 35573

WOOD J L
THE NOCTURNAL URBAN HEAT ISLAND IN AUSTIN, TEXAS.
*17661 APTIC NO. 35470

WOODCOCK K R
SOME APPLICATIONS OF THE IMPLEMENTATION PLANNING PROGRAM.
17881 APTIC NO. 35464

WOODHOUSE G
NOTE: SOME USES OF CALCIUM CHLORIDE AS AN ADDITIVE TO BOILER COALS.
17223 APTIC NO. 35722

WOODS W
AIR POLLUTION EFFECTS ON ANIMALS.
*17818 APTIC NO. 35395

WOODWARD C D
AIR PUMP FLOW CONTROL VALVE FOR ENGINE EXHAUST EMISSION CONTROL SYSTEM.
*17403 APTIC NO. 35504

WORSTER H E
AN ASSESSMENT OF SOME SULFUR-FREE CHEMICAL PULPING PROCESSES.
17060 APTIC NO. 35066

WOUWER R V D
CLINKER COOLER DUST COLLECTOR RECOVERS 60 TPD AT INLAND S WINNIPEG PLANT.
•17404 APTIC NO. 35990

WRIGHT A S
THE DETERMINATION OF TOXIC GASES AND VAPOURS IN AIR.
17491 APTIC NO. 35450

WRIGHT E S
THE POTENTIAL OF THE GAS-TURBINE VEHICLE IN ALLEVIATING AIR POLLUTION.
•17151 APTIC NO. 35586

WYANT S C
TIMED MOTORIZED FLUE CLEANING APPARATUS.
•17405 APTIC NO. 35301

WYATT J P
OCCUPATIONAL LUNG DISEASES AND INFERENTIAL RELATIONSHIPS TO GENERAL POPULATION HAZARDS.
•17779 APTIC NO. 35346

Y

YAGI S
AFTERBURNER APPARATUS FOR ENGINE EXHAUST GAS.
•17406 APTIC NO. 35290
ENGINE EXHAUST GAS RECOMBUSTION APPARATUS.
•17407 APTIC NO. 35915

YAMADA K
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

YAMAKI N
VARIOUS PROBLEMS OF PHOTOCHEMICAL SMOG.
•17662 APTIC NO. 35748

YAMAMOTO H
DATA AND EXAMINATION FOR ESTABLISHING SULFUR OXIDES EMISSION STANDARD.
17846 APTIC NO. 35146

YAMAMOTO K
TOXICITY OF GASES RELEASED BY POLYURETHANE FOAMS SUBJECTED TO SUFFICIENTLY HIGH TEMPERATURE.
•17780 APTIC NO. 35855

YAMAMOTO Y
TOXICITY OF GASES RELEASED BY POLYURETHANE FOAMS SUBJECTED TO SUFFICIENTLY HIGH TEMPERATURE.
17780 APTIC NO. 35855

YAMANAKA C
AIR POLLUTION SURVEY BY MEANS OF LASER RADAR.
•17533 APTIC NO. 35100

YAMASAKI S
ACCELERATED ATMOSPHERIC CORROSION TESTS IN POLLUTED AIR. (2ND REPORT). INFLUENCE OF DEWING ON MILD STEEL IN SULFUR DIOXIDE ENVIRONMENT.
•17827 APTIC NO. 36005

YAMASHITA M
MANAGEMENT OF PATIENTS RECOGNIZED BY THE ENVIRONMENTAL POLLUTION RELIEF LAW DISEASE OF YOKKAICHI CITY ASSOCIATED WITH AIR POLLUTION.
17774 APTIC NO. 35109

YANAGIHARA S
AIR POLLUTION AND AUTOMOTIVE ENGINES (1).
•17408 APTIC NO. 35166

YANEV B
POLLUTION OF THE GROUND ATMOSPHERE IN PERNIC CITY AND ITS EFFECTS ON THE POPULATION.
•17572 APTIC NO. 35386

YAROSH M M
CHANGING EMPHASIS IN THE SITING OF STEAM ELECTRIC POWER PLANTS.
•17899 APTIC NO. 35216

YASUDA T
HEAT-AIR CONDITIONER SOURCE ENERGY FROM THE STANDPOINT OF AIR POLLUTION: A COLLOQUIM.
17106 APTIC NO. 35965

YAVOR V I
PRODUCTION OF SULFURIC ACID FROM REVERBERATORY FURNACE FLUE GASES.
17337 APTIC NO. 35333

YENNAWAR P K
SHORT-TERM AIR QUALITY SURVEYS IN 4 MAJOR CITIES OF INDIA.
•17573 APTIC NO. 35534

YII A
ANALYSIS AND EXPERIMENTS ON CARBURETOR METERING AT THE TRANSITION REGION TO THE MAIN SYSTEM.
17134 APTIC NO. 35614

YOCOM J E
INDOOR/OUTDOOR AIR POLLUTANT RELATIONSHIPS FOR AIR-CONDITIONED BUILDINGS.
•17409 APTIC NO. 35540

YOKOI Y
ACCELERATED ATMOSPHERIC CORROSION TESTS IN POLLUTED AIR. (2ND REPORT). INFLUENCE OF DEWING ON MILD STEEL IN SULFUR DIOXIDE ENVIRONMENT.
17827 APTIC NO. 36005

YOKOYAMA N
DIFFUSION OF AIR POLLUTANTS.
•17663 APTIC NO. 35747

YOSHIDA R
AIR POLLUTION AND INFANTILE BRONCHIAL ASTHMA. REPORT 1. ON THE PREVALENCE OF ASTHMA IN A POLLUTED AREA.
17734 APTIC NO. 35154

YOSHIDA Y
STUDY ON COMBUSTION GAS FROM A PREDETERMINED AMOUNT OF COMBUSTION (I), EFFECT OF THE WALL TEMPERATURE AND THE PRESSURE OF AIR-FUEL MIXTURE ON FORMATION OF EXHAUST GAS.
17387 APTIC NO. 35839

YOSHIKAWA H
EXAMPLES OF CADMIUM POISONING.
•17781 APTIC NO. 35838

YOSHIMURA Y
DESULFURIZATION OF FLUE GAS IN PETROCHEMICAL INDUSTRY AND IT S OPERATING DATA.
•17410 APTIC NO. 35730

YOSHINO M
A SLIDE RULE FOR STACK GAS DISPERSION PATTERN CALCULATION.
•17534 APTIC NO. 35766

YOSHITANI K
HYGIENIC CHEMICAL STUDIES ON PUBLIC HAZARDS BY HARMFUL SUBSTANCES. IV. ATOMIC ABSORPTION PHOTOMETRIC DETERMINATION OF LEAD IN CASOLINE.
17143 APTIC NO. 36006

YOSIM S J
REMOVAL OF LEAD FROM GASES WITH MOLTEN ALKALI METAL CARBONATES.
17242 APTIC NO. 35352

YUSA H
SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY. MARCH 1 - AUGUST 31, 1970.
17675 APTIC NO. 35232

YUSA S
ON THE RELATION BETWEEN THE FLOATABILITY AND THE ELECTRIFICATION OF DUST PARTICLES.
•17411 APTIC NO. 35546

YUSHKEVICH N F
PRODUCTION OF SULFUR FROM SULFUR DIOXIDE.
•17412 APTIC NO. 35413

Z

ZAYCHENKO V M
BRUSH DISCHARGE FILTERS USED FOR THE REMOVAL OF NITRIC OXIDE FROM COKE OVEN GAS.
17289 APTIC NO. 35759

ZEDNIK E
FILTER.
17240 APTIC NO. 35733

ZEGEL W C
EXHAUST EMISSIONS OF LIGHT AIRCRAFT.
•17152 APTIC NO. 35220

ZHULIN H V

UTILIZATION OF FLOCCULATING MEANS FOR PARTICLE SEDIMENTATION FROM GAS CLEANING SOLUTIONS.
*17413 APTIC NO. 35328

ZIELHUIS R L

MEDICAL-BIOLOGICAL EFFECTS OF TRAFFIC EXHAUST.
*17782 APTIC NO. 35118

TOXICOLOGICAL APPRAISAL OF LEAD AS PUBLIC HEALTH HAZARD.
17716 APTIC NO. 35792

AIR POLLUTION, SMOKING, AND MEDICINES.
*17783 APTIC NO. 35986

ZOLLER W H

GASEOUS BROMINE AND PARTICULATE LEAD, VANADIUM, AND BROMINE IN A POLLUTED ATMOSPHERE.
17562 APTIC NO. 35861

ZRAZHEVSKIY N M

THE EFEECT OF OROGRAPHY ON THE CHARACTERISTICS OF THE AIR FLOW WITHIN THE AERODYNAMIC TUBE.
*17664 APTIC NO. 35421

ZUBOVIC P

MINOR ELEMENT DISTRIBUTION IN COAL SAMPLES OF THE INTERIOR COAL PROVINCE.
*17153 APTIC NO. 35619

ZUEV V E

USE OF HIGH-SPEED LASER SPECTROSCOPY TO STUDY THE ABSORPTION SPECTRUM OF ATMOSPHERIC GASES.
*17698 APTIC NO. 35937

ZUTAUT D W

AROMATIC ALDEHYDES AND PHENOLS IN THE EXHAUST FROM LEADED AND UNLEADED FUELS.
17086 APTIC NO. 35477

ORDER FORM

USE RESTRICTED AS INDICATED IN THE INTRODUCTION

SEND TO:

ENVIRONMENTAL PROTECTION AGENCY
AIR POLLUTION TECHNICAL INFORMATION CENTER
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

Date ______________________

Name ______________________

Program ______________________

Address ______________________

THIS FORM IS TO BE USED FOR ORDERING MICROFICHE DUPLICATES. INDICATE THE ARTICLES YOU REQUIRE BY CIRCLING THEIR APTIC NUMBERS. IF YOU DO NOT HAVE ACCESS TO A MICROFICHE READER, YOU MAY REQUEST PAPER COPIES. HOWEVER, MICROFICHE CAN USUALLY BE PROVIDED IN ABOUT 1/5 THE TIME REQUIRED TO PROVIDE PAPER COPIES.

35041	35042	35043	35044	35045	35046	35047	35048	35049	35050	35051	35052	35053	35054
35055	35056	35057	35059	35060	35061	35062	35063	35064	35065	35066	35067	35068	35069
35070	35071	35072	35073	35074	35075	35076	35077	35078	35079	35080	35081	35082	35083
35084	35085	35086	35087	35088	35089	35090	35091	35092	35093	35094	35095	35096	35097
35098	35099	35100	35101	35102	35103	35104	35105	35107	35109	35110	35112	35113	35114
35115	35116	35117	35118	35119	35120	35121	35122	35123	35124	35126	35127	35128	35129
35130	35131	35132	35133	35134	35135	35136	35137	35138	35139	35140	35141	35142	35143
35145	35146	35147	35148	35149	35150	35151	35152	35153	35154	35155	35156	35157	35158
35159	35160	35161	35162	35163	35164	35165	35166	35167	35168	35169	35171	35172	35173
35174	35175	35176	35177	35178	35179	35180	35181	35182	35183	35184	35185	35188	35189
35190	35191	35192	35193	35196	35197	35198	35199	35200	35201	35202	35203	35204	35205
35206	35207	35208	35209	35210	35211	35212	35213	35214	35215	35216	35217	35218	35220
35221	35222	35223	35224	35225	35226	35227	35228	35229	35230	35232	35233	35234	35235
35236	35237	35238	35239	35240	35241	35242	35243	35244	35245	35246	35247	35248	35249
35251	35254	35255	35256	35259	35260	35262	35263	35264	35265	35267	35268	35269	35270
35271	35272	35273	35275	35276	35277	35278	35279	35280	35281	35282	35283	35284	35285
35286	35287	35288	35289	35290	35291	35292	35294	35295	35296	35297	35298	35299	35300
35301	35302	35303	35304	35305	35306	35307	35308	35309	35311	35312	35313	35314	35315
35316	35317	35318	35319	35320	35321	35323	35324	35325	35326	35327	35328	35329	35330
35331	35332	35333	35334	35335	35336	35337	35338	35340	35341	35343	35344	35345	35346
35347	35348	35349	35350	35351	35352	35353	35354	35355	35356	35357	35358	35360	35361
35362	35363	35364	35365	35367	35368	35371	35372	35373	35375	35376	35377	35378	35379
35380	35381	35382	35383	35384	35385	35386	35387	35388	35389	35390	35391	35392	35393
35394	35395	35397	35398	35399	35400	35401	35402	35403	35404	35405	35406	35407	35408

35409 35410 35412 35413 35414 35417 35418 35419 35420 35421 35422 35423 35424 35425
35426 35429 35430 35431 35432 35433 35434 35435 35436 35438 35440 35442 35444 35445
35446 35447 35448 35449 35450 35451 35452 35453 35454 35455 35457 35458 35459 35460
35461 35462 35463 35464 35465 35466 35467 35468 35469 35470 35471 35472 35473 35474
35475 35476 35477 35478 35479 35480 35481 35482 35483 35484 35485 35486 35487 35488
35489 35490 35491 35492 35493 35494 35495 35496 35497 35498 35499 35500 35501 35503
35504 35505 35506 35508 35509 35510 35511 35512 35514 35515 35516 35517 35518 35519
35520 35521 35522 35523 35524 35525 35526 35527 35528 35529 35530 35531 35532 35533
35534 35535 35536 35537 35538 35539 35540 35541 35542 35543 35544 35545 35546 35547
35548 35549 35550 35551 35552 35553 35554 35555 35556 35557 35558 35559 35560 35561
35562 35563 35564 35565 35566 35567 35568 35570 35571 35572 35573 35574 35575 35578
35579 35580 35581 35583 35584 35586 35587 35588 35590 35591 35592 35595 35597 35598
35599 35600 35601 35602 35603 35604 35605 35607 35608 35609 35610 35611 35613 35614
35616 35617 35618 35619 35620 35621 35622 35623 35624 35625 35626 35627 35628 35629
35630 35631 35632 35633 35634 35635 35636 35638 35639 35640 35641 35642 35643 35644
35645 35646 35647 35648 35650 35651 35653 35654 35655 35657 35658 35659 35660 35661
35663 35664 35665 35666 35667 35668 35669 35670 35671 35672 35673 35674 35675 35676
35677 35678 35679 35680 35681 35682 35683 35684 35685 35686 35687 35688 35689 35690
35691 35692 35693 35694 35695 35697 35698 35699 35700 35701 35702 35703 35704 35705
35706 35708 35709 35710 35711 35712 35713 35714 35715 35716 35717 35718 35719 35720
35721 35722 35723 35724 35725 35726 35727 35728 35730 35732 35733 35734 35735 35736
35737 35738 35740 35741 35742 35743 35744 35745 35746 35747 35748 35749 35750 35751
35752 35753 35754 35755 35756 35757 35758 35759 35760 35761 35762 35763 35764 35765
35766 35767 35768 35769 35770 35771 35772 35773 35774 35776 35777 35778 35779 35781
35782 35784 35785 35786 35787 35788 35789 35790 35791 35792 35793 35803 35805 35806
35807 35809 35810 35811 35812 35813 35814 35815 35816 35817 35818 35821 35823 35824
35825 35826 35827 35828 35829 35830 35831 35832 35833 35834 35835 35836 35837 35838
35839 35840 35841 35844 35845 35846 35847 35848 35849 35850 35851 35852 35853 35855
35856 35857 35858 35859 35860 35861 35862 35863 35864 35865 35866 35867 35868 35869
35870 35871 35872 35874 35875 35876 35877 35878 35879 35880 35881 35882 35883 35884
35885 35886 35887 35888 35889 35890 35892 35893 35894 35895 35896 35897 35898 35899
35900 35901 35915 35916 35917 35918 35919 35920 35921 35922 35923 35924 35925 35926
35927 35928 35929 35930 35931 35932 35933 35934 35935 35936 35937 35939 35940 35941
35942 35943 35944 35945 35946 35947 35949 35950 35951 35952 35953 35954 35955 35956
35957 35958 35959 35962 35963 35964 35965 35966 35967 35968 35969 35970 35972 35973
35974 35975 35976 35977 35978 35979 35980 35981 35982 35983 35984 35985 35986 35987
35988 35989 35990 35991 35992 35993 35994 35995 35996 35997 35998 35999 36000 36001
36002 36003 36004 36005 36006 36007 36008 36009 36011 36012 36013 36014 36015 36016
36017 36018 36019 36020 36021 36022 36023 36024 36025 36027 36028

©U.S. GOVERNMENT PRINTING OFFICE: 1972 484-484 (164) 1/3